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BRATTLEBORO, VT.

1902

LABORATORY OF HYGIENE.

VERMONT STATE BOARD OF HEALTH.

STATE BOARD OF HEALTH.

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C. P. MOAT, S. B., Chemist.	Burlington.

SUGGESTIONS AND INSTRUCTIONS.

M. J. WILTSE, M. D., Director.

Through the columns of this Bulletin, I wish to call the attention of the people to some facts which have apparently escaped notice.

First.—Read Act. No. 90 of the last legislature (found in this issue), and become conversant with the class of work done at our Laboratory. For the benefit of the uninformed, I will mention that there are sixty stations in this state where outfits are kept for the transportation of specimens (note the list following) in cases of suspected diphtheria, typhoid fever, tuberculosis and malaria. The water outfit is furnished on application, and no specimens of water are examined except those received in our sterile containers. With every outfit is furnished a blank with *full* instructions for collecting and sending specimens. *Read* these directions and *fill* out the blanks. It will take but a moment. It will be of great assistance to, us and of benefit to you, for you will receive a definite and prompt report. Do not send material for examination without marking the same plainly with your name and address at least, preferably the name or initials of the patient as well, so that upon reference to our records at some later time we may be able to inform you, should such information be required, as is oftentimes the case. You do not realize the importance of these small details because you are not conversant with laboratory methods. You will note from the following tables that we have an average of from three hundred and seventy-five to four hundred specimens a month for examination, and if we are compelled to look up minor details there must necessarily be a delay of the report. The Laboratory is for the people. We are ever ready to assist you in any way possible, and we only ask that you follow closely the directions

furnished, in order that we may give you a prompt, efficient and reliable diagnosis.

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Alburgh Centre, Dr. G. S. Goodfellow.	Middlebury, Dr. I. Sterna.
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Chelsea, A. R. Hood & Son.	Rutland, L. A. Miner, C. W. Ward.
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Enosburg Falls, J. M. Jeffords.	St. Albans, F. E. Welch & Co.
Essex Junction, Junction Pharmacy.	St. Johnsbury, Stiles' Drug Store.
Fair Haven, Green Bros.	Swanton, Swanton Drug Store.
Hardwick, O. J. Paquette.	Underhill, Dr. W. S. Nay.
Hinesburgh, A. S. Hull.	Vergennes, Timothy Neville.
Island Pond, J. W. Thurston.	Waterbury, Evans & Bryan.
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Lyndonville, Cheeney Bros.	Winooski, Barnes Pharmacy.
	Woodstock, A. B. Morgan.
	Wallingford, C. S. Saunders.
	Wells River, J. S. Shattuck.

NUMBER 90.

AN ACT ESTABLISHING A LABORATORY OF HYGIENE AND REPEALING No. 115 OF THE ACTS OF 1898.

It is hereby enacted by the General Assembly of the State of Vermont:

SECTION 1. The State Board of Health is authorized to establish and equip with the proper and necessary apparatus, utensils and instruments, a Laboratory of Hygiene, for the chemical and bacteriological examination of water supplies, milk and all food products, and the examination of cases and suspected cases of diphtheria, typhoid fever, tuberculosis, malaria, and other infectious and contagious diseases, and may conduct a school of instruction for health officers of the state, at least once a year, at such time and place as they shall direct. They may, at their discretion, issue a periodical, the object of which shall be to publish the results of the work done at the Laboratory, and also the latest approved methods for the protection of the public health, said publication to be furnished free to all health officers of the state.

SEC. 2. The State Board of Health shall appoint, and may remove in their

discretion, a director of such Laboratory, who shall keep a record of all specimens sent to him for examination by the residents of the state, and examine these specimens without unnecessary delay. He shall, biennially, before the first of January, make a full report to the State Board of Health of all matters pertaining to the Laboratory, and shall make such other and special reports as the State Board may direct. The director of the Laboratory, with the approval of the State Board of Health, may appoint such assistants as may be required.

SEC. 3. The annual salary of the director shall not exceed three thousand dollars, the combined annual salaries of the first and second assistants shall not exceed twenty-seven hundred dollars, which salaries shall be fixed by the State Board of Health.

SEC. 4. The use of the Laboratory, and all investigations mentioned in this Act therein made, shall be free to the people of this state. And whenever the state's attorney of any county, on the order of a judge of the Supreme court, shall request for use in any criminal case pending in his office, an expert investigation, chemical or pathological, of any substance, such investigation shall be made at the Laboratory forthwith, without charge to the state, and the expert making such investigation shall submit the results of his work to the state's attorney at whose request it is done and shall attend court as a witness at any place in the state when required to do so by subpoena and submit in court the results of his investigations, and shall be paid as such witness his actual expenses of attendance, when summoned by the state.

SEC. 5. The sum of two thousand dollars is hereby appropriated for the purpose of procuring the additional necessary apparatus, utensils and instruments for the equipment of such Laboratory; and the sum of ten thousand dollars is hereby appropriated annually to pay the salaries, procure the necessary supplies, and to meet the other necessary expenses of said Laboratory, and to pay the expenses of conducting the school of instruction for health officers, and the expense of issuing the periodical, which sum, or such portion of it as they shall deem necessary, shall be expended under the supervision of the State Board of Health. The total annual expense of maintaining said Laboratory shall not exceed the sum of ten thousand dollars.

SEC. 6. No. 115 of the Acts of 1898, entitled "An Act relating to Public Health," is hereby repealed.

SEC. 7. This Act shall take effect from its passage.

Approved November 15, 1900.

The following letter has been sent to our agents making explanation as to the recent change in our diphtheria outfits. Each outfit contains full instructions and in addition, I would say again, *follow closely* these instructions to ensure satisfactory results.

Dear Sir:—

I am sending you by express this day, as requested, some diphtheria outfits. You will note that we no longer include a tube with media, consequently there is nothing about this outfit now that can spoil. The doctor is instructed to make application of the swabs to nose and throat, sending these swabs to the Laboratory, where cultures will be made and thus do away with contamination, which has been troublesome heretofore. If not too much trouble, I would like you to ask the physicians in your territory to return any diphtheria outfits they may have lying about their offices. There are quantities of these tubes distributed over the state and we desire to call them in.

Thanking you for your assistance in this matter, I am,

Very truly yours,

The examination for the percentage of alcohol in beverages has become so common that it was thought advisable to print at this time the following tables. Upon reference to these, one may correctly interpret for himself, a laboratory report. The method used is universal. However, as a word or two of explanation may be allowed, I would state that the apparatus required for this work is a Liebig condenser, an accurate scale, a pycnometer and the ordinary flasks of the Laboratory.

The method in detail is as follows:—

METHODS FOR THE ANALYSIS OF FERMENTED AND DISTILLED LIQUORS.

I. DETERMINATION OF SPECIFIC GRAVITY.

The specific gravity is ascertained at 15.5° C. by means of a pycnometer or a Westphal balance controlled by a pycnometer, or a delicate hydrometer may be used which has been carefully calibrated by a pycnometer.

2. DETERMINATION OF ALCOHOL.

(a) IN FERMENTED LIQUORS.

(1) BY WEIGHT.

One hundred c. c. of the liquor are measured into a flask of from 250 to 300 c. c. capacity, 50 c. c. of water added, the flask attached to a vertical condenser by means of a bent tube, and 100 c. c. distilled. The specific gravity of the distillate is determined as in 1. The distillate is also weighed, or its weight calculated from the specific gravity. The corresponding percentage of alcohol by weight is obtained from the appended table and this figure multiplied by the weight of the distillate, and the result divided by the weight of the sample taken, gives the per cent of alcohol by weight contained therein.

(2) BY VOLUME.

The percentage of alcohol by volume of the liquor is the same as that of the distillate and is obtained from the appended table.

(b) IN DISTILLED LIQUORS.

(1) BY WEIGHT.

About 30 grams of the liquor are diluted to 150 c. c., 100 c. c. distilled, and the per cent of alcohol by weight determined as under fermented liquors.

(2) BY VOLUME.

The percentage of alcohol by volume in the distillate is obtained from the appended table, this figure divided by the volume of the liquor taken for the determination (calculated from the specific gravity), and the result multiplied by 100.

Percentage of alcohol by weight and by volume.

[Recalculated from the determinations of Gilpin, Drinkwater, and Squibb, by EDGAR RICHARDS.]

Specific gravity at 59° F.	Per cent alcohol by volume.	Per cent alcohol by weight.	Specific gravity at 59° F.	Per cent alcohol by volume.	Per cent alcohol by weight.	Specific gravity at 59° F.	Per cent alcohol by volume.	Per cent alcohol by weight.	Specific gravity at 59° F.	Per cent alcohol by volume.	Per cent alcohol by weight.
1.00000	0.00	0.00	0.99629	2.50	1.99	0.99281	5.00	4.00	0.98959	7.50	6.02
0.99992	.05	.04	.622	.55	2.03	.274	.05	.04	.753	.55	.08
.9984	.10	.08	.615	.60	.07	.268	.10	.08	.947	.60	.10
.976	.15	.12	.607	.65	.11	.261	.15	.12	.940	.65	.14
.968	.20	.16	.600	.70	.15	.255	.20	.16	.934	.70	.18
.961	.25	.20	.593	.75	.19	.248	.25	.20	.928	.75	.22
.953	.30	.24	.586	.80	.23	.241	.30	.24	.922	.80	.26
.945	.35	.28	.579	.85	.27	.235	.35	.28	.916	.85	.30
.937	.40	.32	.571	.90	.31	.228	.40	.32	.909	.90	.34
.930	.45	.36	.564	.95	.35	.222	.45	.36	.903	.95	.38
.99923	0.50	0.40	.99587	3.00	2.39	.99215	5.50	4.40	.98897	8.00	6.42
.915	.55	.44	.550	.05	.43	.208	.55	.44	.891	.05	.46
.907	.60	.48	.543	.10	.47	.202	.60	.48	.885	.10	.50
.900	.65	.52	.536	.15	.51	.195	.65	.52	.879	.15	.54
.892	.70	.56	.529	.20	.55	.189	.70	.56	.873	.20	.58
.884	.75	.60	.522	.25	.59	.182	.75	.60	.867	.25	.62
.877	.80	.64	.515	.30	.64	.175	.80	.64	.861	.30	.67
.869	.85	.67	.508	.35	.68	.169	.85	.68	.855	.35	.71
.861	.90	.71	.501	.40	.72	.162	.90	.72	.849	.40	.75
.854	.95	.75	.494	.45	.76	.156	.95	.76	.843	.45	.79
.99849	1.00	0.79	.99487	3.50	2.80	.99149	6.00	4.80	.98837	8.50	6.83
.843	.05	.83	.480	.55	.84	.143	.05	.84	.831	.55	.87
.834	.10	.87	.473	.60	.88	.136	.10	.88	.825	.60	.91
.827	.15	.91	.466	.65	.92	.130	.15	.92	.819	.65	.95
.819	.20	.95	.459	.70	.96	.123	.20	.96	.813	.70	.99
.813	.25	.99	.452	.75	3.00	.117	.25	5.00	.807	.75	7.08
.805	.30	1.08	.445	.80	.04	.111	.30	.05	.801	.80	.07
.797	.35	.07	.438	.85	.08	.104	.35	.09	.795	.85	.11
.790	.40	.11	.431	.90	.12	.098	.40	.13	.789	.90	.15
.783	.45	.15	.424	.95	.16	.091	.45	.17	.783	.95	.19
.99775	1.50	1.19	.99417	4.00	3.20	.99085	6.50	5.21	.98777	9.00	7.23
.768	.55	.23	.410	.05	.24	.079	.55	.25	.771	.05	.27
.760	.60	.27	.403	.10	.28	.072	.60	.29	.765	.10	.31
.753	.65	.31	.397	.15	.32	.066	.65	.33	.759	.15	.35
.745	.70	.35	.390	.20	.36	.059	.70	.37	.754	.20	.39
.738	.75	.39	.383	.25	.40	.053	.75	.41	.748	.25	.43
.731	.80	.43	.376	.30	.44	.047	.80	.45	.742	.30	.46
.723	.85	.47	.369	.35	.48	.040	.85	.49	.736	.35	.50
.716	.90	.51	.363	.40	.52	.034	.90	.53	.730	.40	.54
.708	.95	.55	.356	.45	.56	.027	.95	.57	.724	.45	.58
.99701	2.00	1.59	.99349	4.50	3.60	.99021	7.00	5.61	.98719	9.50	7.64
.694	.05	.63	.342	.55	.64	.015	.05	.65	.713	.55	.68
.687	.10	.67	.335	.60	.68	.009	.10	.69	.707	.60	.72
.679	.15	.71	.329	.65	.72	.002	.15	.73	.701	.65	.76
.672	.20	.75	.322	.70	.76	.98998	.20	.77	.695	.70	.80
.665	.25	.79	.315	.75	.80	.990	.25	.81	.689	.75	.84
.658	.30	.83	.308	.80	.84	.984	.30	.86	.683	.80	.88
.651	.35	.87	.301	.85	.88	.978	.35	.90	.678	.85	.92
.643	.40	.91	.295	.90	.92	.971	.40	.94	.672	.90	.96
.636	.45	.95	.288	.95	.96	.965	.45	.98	.666	.95	8.00

Percentage of alcohol by weight and by volume—Continued.

[Recalculated from the determinations of Gilpin, Drinkwater, and Squibb, by EDGAR RICHARDS.]

Specific gravity at 60° F.	Per cent alcohol by volume.	Per cent alcohol by weight.	Specific gravity at 60° F.	Per cent alcohol by volume.	Per cent alcohol by weight.	Specific gravity at 60° F.	Per cent alcohol by volume.	Per cent alcohol by weight.	Specific gravity at 60° F.	Per cent alcohol by volume.	Per cent alcohol by weight.	Specific gravity at 60° F.	Per cent alcohol by volume.	Per cent alcohol by weight.
0.98660	10.00	8.04	0.98381	12.50	10.08	0.98114	15.00	12.13	0.97859	17.50	14.19			
654	.05	.08	375	.55	.12	108	.05	.17	853	.55	.23			
649	.10	.12	370	.60	.16	104	.10	.21	848	.60	.27			
643	.15	.16	364	.65	.20	999	.15	.25	843	.65	.31			
637	.20	.20	359	.70	.24	993	.20	.29	838	.70	.35			
632	.25	.24	353	.75	.28	988	.25	.33	833	.75	.40			
626	.30	.29	348	.80	.32	983	.30	.38	828	.80	.44			
620	.35	.33	342	.85	.37	978	.35	.42	823	.85	.48			
614	.40	.37	337	.90	.41	973	.40	.46	818	.90	.52			
609	.45	.41	331	.95	.45	968	.45	.50	813	.95	.56			
.98603	10.50	8.45	.98326	13.00	10.49	.98063	15.50	12.54	.97808	18.00	14.60			
597	.55	.49	321	.05	.53	957	.55	.58	808	.05	.64			
592	.60	.53	315	.10	.57	952	.60	.62	798	.10	.68			
586	.65	.57	310	.15	.61	947	.65	.66	793	.15	.73			
580	.70	.61	306	.20	.65	942	.70	.70	788	.20	.77			
575	.75	.65	299	.25	.69	937	.75	.75	783	.25	.81			
569	.80	.70	294	.30	.74	932	.80	.79	778	.30	.85			
563	.85	.74	289	.35	.78	926	.85	.83	773	.35	.89			
557	.90	.78	283	.40	.82	921	.90	.87	768	.40	.94			
552	.95	.82	278	.45	.86	916	.95	.91	763	.45	.98			
.98546	11.00	8.86	.98273	13.50	10.90	.98011	16.00	12.95	.97758	18.50	15.02			
540	.05	.90	267	.55	.94	905	.05	.99	753	.55	.06			
535	.10	.94	262	.60	.98	901	.10	13.03	748	.60	.10			
529	.15	.98	256	.65	11.02	.97996	.15	.08	743	.65	.14			
524	.20	9.02	251	.70	.06	991	.20	.12	738	.70	.18			
518	.25	.07	246	.75	.11	986	.25	.16	733	.75	.22			
513	.30	.11	240	.80	.15	980	.30	.20	728	.80	.27			
507	.35	.15	235	.85	.19	975	.35	.24	723	.85	.31			
502	.40	.19	230	.90	.23	970	.40	.28	718	.90	.35			
496	.45	.23	224	.95	.27	965	.45	.33	713	.95	.39			
.98491	11.50	9.27	.98219	14.00	11.31	.97960	16.50	13.37	.97708	19.00	15.43			
485	.55	.81	214	.05	.35	955	.55	.41	703	.05	.47			
479	.60	.85	209	.10	.39	950	.60	.45	698	.10	.51			
474	.65	.89	203	.15	.43	945	.65	.49	693	.15	.55			
468	.70	.43	198	.20	.47	940	.70	.53	688	.20	.59			
463	.75	.47	193	.25	.52	935	.75	.57	683	.25	.63			
457	.80	.51	188	.30	.56	929	.80	.62	678	.30	.68			
452	.85	.55	182	.35	.60	924	.85	.66	673	.35	.72			
446	.90	.59	177	.40	.64	919	.90	.70	668	.40	.76			
441	.95	.63	172	.45	.68	914	.95	.74	663	.45	.80			
.98435	12.01	9.67	.98167	14.50	11.72	.97909	17.00	13.78	.97658	19.50	15.84			
430	.05	.71	161	.55	.76	904	.05	.82	653	.55	.85			
424	.10	.75	156	.60	.80	899	.10	.86	648	.60	.89			
419	.15	.79	151	.65	.84	894	.15	.90	643	.65	.97			
413	.20	.83	146	.70	.88	889	.20	.94	638	.70	10.01			
408	.25	.87	140	.75	.93	884	.25	.98	633	.75	.05			
402	.30	.92	135	.80	.97	879	.30	14.03	628	.80	.09			
397	.35	.96	130	.85	12.01	874	.35	.07	623	.85	.14			
391	.40	10.00	125	.90	.05	867	.40	.11	618	.90	.18			
386	.45	.04	119	.95	.09	864	.45	.15	613	.95	.22			

Percentage of alcohol by weight and by volume—Continued.

[Recalculated from the determinations of Gilpin, Drinkwater, and Squibb, by EDGAR RICHARDS.]

Specific gravity at 59° F.	Per cent alcohol by volume.	Per cent alcohol by weight.	Specific gravity at 59° F.	Per cent alcohol by volume.	Per cent alcohol by weight.	Specific gravity at 59° F.	Per cent alcohol by volume.	Per cent alcohol by weight.	Specific gravity at 59° F.	Per cent alcohol by volume.	Per cent alcohol by weight.
0.97608	20.00	16.26	0.97355	22.50	18.34	0.97097	25.00	20.43	0.96828	27.50	22.54
593	.05	.30	350	.55	.38	092	.05	.47	822	.55	.58
598	.10	.34	345	.60	.42	086	.10	.51	816	.60	.62
593	.15	.38	340	.65	.47	081	.15	.56	811	.65	.67
588	.20	.42	335	.70	.51	076	.20	.60	805	.70	.71
583	.25	.46	330	.75	.55	071	.25	.64	800	.75	.75
578	.30	.51	324	.80	.59	065	.30	.68	794	.80	.79
573	.35	.56	319	.85	.63	060	.35	.72	789	.85	.83
568	.40	.59	314	.90	.68	055	.40	.77	783	.90	.88
563	.45	.63	309	.95	.72	049	.45	.81	778	.95	.92
.97558	20.50	16.67	.97304	23.00	18.76	.97044	25.50	20.85	.96772	28.00	22.96
552	.55	.71	299	.05	.80	039	.55	.89	766	.05	23.00
547	.60	.75	294	.10	.84	033	.60	.93	761	.10	.04
542	.65	.80	289	.15	.88	028	.65	.98	775	.15	.09
537	.70	.84	284	.20	.92	023	.70	21.02	749	.20	.13
532	.75	.88	278	.25	.96	018	.75	.06	744	.25	.17
527	.80	.92	273	.30	19.01	012	.80	.10	738	.30	.21
522	.85	.96	268	.35	.05	007	.85	.14	733	.35	.25
517	.90	17.01	263	.40	.09	001	.90	.19	726	.40	.30
512	.95	.05	258	.45	.13	.96996	.95	.23	721	.45	.34
.97507	21.00	17.09	.97253	23.50	19.17	.96991	26.00	21.27	.96715	28.50	23.38
502	.05	.13	247	.55	.21	986	.05	.31	709	.55	.42
497	.10	.17	242	.60	.25	980	.10	.35	704	.60	.47
492	.15	.22	237	.65	.30	975	.15	.40	698	.65	.51
487	.20	.26	232	.70	.34	969	.20	.44	692	.70	.55
482	.25	.30	227	.75	.38	964	.25	.48	687	.75	.60
477	.30	.34	222	.80	.42	959	.30	.52	681	.80	.64
472	.35	.38	216	.85	.46	953	.35	.56	675	.85	.68
467	.40	.43	211	.90	.51	949	.40	.61	669	.90	.72
462	.45	.47	206	.95	.55	942	.45	.65	664	.95	.77
.97457	21.50	17.51	.97201	24.00	19.59	9.6937	26.50	21.69	.96658	29.00	23.81
451	.55	.55	196	.05	.63	932	.55	.73	652	.05	.85
446	.60	.59	191	.10	.67	926	.60	.77	646	.10	.89
441	.65	.63	185	.15	.72	921	.65	.82	640	.15	.94
436	.70	.67	180	.20	.76	915	.70	.86	635	.20	.98
431	.75	.71	175	.25	.80	910	.75	.90	629	.25	24.02
426	.80	.76	170	.30	.84	905	.80	.94	623	.30	.06
421	.85	.80	165	.35	.88	899	.85	.98	617	.35	.10
416	.90	.84	159	.40	.93	894	.90	23.03	611	.40	.15
411	.95	.88	154	.45	.97	888	.95	.07	605	.45	.19
.97406	22.00	17.92	.97149	24.50	20.01	.96883	27.00	22.11	.96600	29.50	24.23
401	.05	.96	144	.55	.05	877	.05	.15	594	.55	.27
396	.10	18.00	139	.60	.09	872	.10	.20	587	.60	.32
391	.15	.05	133	.65	.14	866	.15	.24	582	.65	.36
386	.20	.09	128	.70	.18	861	.20	.28	576	.70	.40
381	.25	.13	123	.75	.22	755	.25	.33	570	.75	.45
375	.30	.17	118	.80	.26	850	.30	.37	564	.80	.49
370	.35	.21	113	.85	.30	844	.35	.41	559	.85	.53
365	.40	.26	107	.90	.35	839	.40	.45	553	.90	.57
360	.45	.30	102	.95	.39	833	.45	.50	547	.95	.62

Percentage of alcohol by weight and by volume—Continued.

[Recalculated from the determinations of Gilpin, Drinkwater, and Squibb, by EDGAR RICHARDS.]

Specific gravity at 60° F.	Per cent alcohol by volume.	Per cent alcohol by weight.	Specific gravity at 60° F.	Per cent alcohol by volume.	Per cent alcohol by weight.	Specific gravity at 60° F.	Per cent alcohol by volume.	Per cent alcohol by weight.	Specific gravity at 60° F.	Per cent alcohol by volume.	Per cent alcohol by weight.
0.96541	30.00	24.66	0.96235	32.50	26.80	0.95910	35.00	28.96	0.95560	37.50	31.14
535	.06	.70	229	.55	.84	903	.06	29.00	552	.55	.18
529	.10	.74	222	.60	.89	896	.10	.05	545	.60	.23
523	.15	.79	216	.65	.93	889	.15	.09	538	.65	.27
517	.20	.83	210	.70	.97	883	.20	.13	531	.70	.32
511	.25	.87	204	.75	27.02	876	.25	.18	523	.75	.36
505	.30	.91	197	.80	.06	869	.30	.22	516	.80	.40
499	.35	.95	191	.85	.10	862	.35	.26	509	.85	.45
493	.40	25.00	185	.90	.14	855	.40	.30	502	.90	.49
487	.45	.04	178	.95	.19	848	.45	.35	494	.95	.54
.96181	30.50	25.08	.96172	33.00	27.23	.95842	35.50	29.39	.95487	38.00	31.58
475	.55	.12	166	.05	.27	835	.55	.43	480	.05	.63
469	.60	.17	159	.10	.32	828	.60	.48	472	.10	.67
463	.65	.21	153	.15	.36	821	.65	.52	465	.15	.72
457	.70	.25	146	.20	.40	814	.70	.57	457	.20	.76
451	.75	.30	140	.25	.45	807	.75	.61	450	.25	.81
445	.80	.34	133	.30	.49	800	.80	.65	442	.30	.85
439	.85	.38	127	.35	.53	794	.85	.70	435	.35	.90
433	.90	.42	120	.40	.57	787	.90	.74	427	.40	.94
427	.95	.47	114	.45	.62	780	.95	.79	420	.45	.99
.96421	31.00	25.51	.96108	33.50	27.66	.95773	36.00	29.86	.95413	38.50	32.03
415	.05	.55	101	.55	.70	766	.05	.87	405	.55	.07
409	.10	.60	095	.60	.75	759	.10	.92	398	.60	.12
403	.15	.64	088	.65	.79	752	.15	.96	390	.65	.16
396	.20	.68	082	.70	.83	745	.20	30.00	383	.70	.20
390	.25	.73	075	.75	.88	738	.25	.05	375	.75	.25
384	.30	.77	069	.80	.92	731	.30	.09	368	.80	.29
378	.35	.81	062	.85	.96	724	.35	.13	360	.85	.33
372	.40	.85	056	.90	28.00	717	.40	.17	353	.90	.37
366	.45	.90	049	.95	.05	710	.45	.22	345	.95	.42
.96360	31.50	25.94	.96043	34.00	28.09	.95703	36.50	30.26	.95338	39.00	32.46
353	.55	.96	036	.05	.13	695	.55	.30	330	.05	.50
347	.60	26.03	030	.10	.18	688	.60	.35	323	.10	.55
341	.65	.07	023	.15	.22	681	.65	.39	315	.15	.59
335	.70	.11	016	.20	.26	674	.70	.44	307	.20	.64
329	.75	.16	010	.25	.31	667	.75	.48	300	.25	.68
323	.80	.20	003	.30	.35	660	.80	.52	292	.30	.72
316	.85	.24	.95996	.35	.39	653	.85	.57	284	.35	.77
310	.90	.28	990	.40	.43	646	.90	.61	277	.40	.81
304	.95	.33	983	.45	.48	639	.95	.66	269	.45	.86
.96298	32.00	26.37	.95977	34.50	28.52	.95632	37.00	30.70	.95262	39.50	32.90
292	.05	.41	970	.55	.56	625	.05	.74	254	.55	.95
285	.10	.46	963	.60	.61	618	.10	.79	246	.60	.99
279	.15	.50	957	.65	.65	610	.15	.83	239	.65	33.04
273	.20	.54	950	.70	.70	603	.20	.88	231	.70	.03
267	.25	.59	943	.75	.74	596	.25	.92	223	.75	.13
260	.30	.63	937	.80	.78	589	.30	.96	216	.80	.17
254	.35	.67	930	.85	.83	581	.35	31.01	208	.85	.22
248	.40	.71	923	.90	.87	574	.40	.05	200	.90	.27
241	.45	.76	917	.95	.92	567	.45	.10	193	.95	.31

Percentage of alcohol by weight and by volume—Continued.

[Recalculated from the determinations of Gilpin, Drinkwater, and Squibb, by EDGAR RICHARDS.]

Specific gravity at 59° F.	Per cent alcohol by volume.	Per cent alcohol by weight.	Specific gravity at 59° F.	Per cent alcohol by volume.	Per cent alcohol by weight.	Specific gravity at 59° F.	Per cent alcohol by volume.	Per cent alcohol by weight.	Specific gravity at 59° F.	Per cent alcohol by volume.	Per cent alcohol by weight.
0.95185	40.00	33.35	0.94786	42.50	35.58	0.94364	45.00	37.84	0.93916	47.50	40.13
177	.06	.89	778	.55	.63	365	.05	.89	906	.55	.18
169	.10	.44	770	.60	.67	846	.10	.93	898	.60	.22
161	.15	.48	761	.65	.72	838	.15	.98	888	.65	.27
154	.20	.53	753	.70	.76	829	.20	88.02	879	.70	.32
146	.25	.57	745	.75	.81	820	.25	.07	870	.75	.37
138	.30	.61	737	.80	.85	811	.30	.12	861	.80	.41
130	.35	.66	729	.85	.90	802	.35	.16	852	.85	.46
122	.40	.70	720	.90	.94	794	.40	.21	842	.90	.51
114	.45	.75	712	.95	.99	785	.45	.25	833	.95	.56
.95107	40.50	33.79	.94704	43.00	36.03	.94276	45.50	38.30	.93824	48.00	40.60
099	.55	.84	696	.06	.08	267	.55	.35	815	.05	.65
091	.60	.88	687	.10	.12	258	.60	.39	805	.10	.69
083	.65	.93	679	.15	.17	250	.65	.44	796	.15	.74
075	.70	.97	670	.20	.21	241	.70	.48	786	.20	.78
067	.75	84.02	662	.25	.23	232	.75	.53	777	.25	.83
059	.80	.06	654	.30	.30	223	.80	.57	768	.30	.88
052	.85	.11	645	.35	.35	214	.85	.62	758	.35	.92
044	.90	.15	637	.40	.39	206	.90	.66	749	.40	.97
036	.95	.20	628	.45	.44	197	.95	.71	739	.45	41.01
.95028	41.00	34.24	.94620	43.50	36.48	.94188	46.00	38.75	.93730	48.50	41.06
.20	.05	.28	612	.55	.53	179	.05	.80	721	.55	.11
012	.10	.33	603	.60	.57	170	.10	.84	711	.60	.15
004	.15	.37	595	.65	.62	161	.15	.89	702	.65	.20
.94996	.20	.42	586	.70	.66	152	.20	.93	692	.70	.24
988	.25	.46	578	.75	.71	143	.25	.98	683	.75	.29
980	.30	.50	570	.80	.75	134	.30	89.03	679	.80	.34
972	.35	.55	561	.85	.80	125	.35	.07	664	.85	.38
964	.40	.59	553	.90	.84	116	.40	.12	655	.90	.43
956	.45	.64	544	.95	.89	107	.45	.16	645	.95	.47
.94948	41.50	34.68	.94536	44.00	36.93	.94098	46.50	39.21	.93636	49.00	41.52
940	.55	.73	537	.05	.98	089	.55	.26	636	.05	.57
932	.60	.77	519	.10	37.02	080	.60	.30	617	.10	.61
924	.65	.82	510	.15	.07	071	.65	.35	607	.15	.66
916	.70	.86	502	.20	.11	062	.70	.39	598	.20	.71
908	.75	.91	493	.25	.16	053	.75	.44	588	.25	.76
900	.80	.95	484	.30	.21	044	.80	.49	578	.30	.80
892	.85	35.00	476	.35	.25	035	.85	.53	569	.35	.85
884	.90	.04	467	.40	.30	026	.90	.58	559	.40	.90
876	.95	.09	459	.45	.34	017	.95	.63	550	.45	.94
.94868	42.00	35.13	.94450	44.50	37.39	.94008	47.00	39.67	.93540	49.50	41.99
860	.05	.18	441	.55	.44	.93999	.05	.72	530	.55	42.04
852	.10	.22	433	.60	.48	990	.10	.76	521	.60	.06
843	.15	.27	424	.65	.53	980	.15	.81	511	.65	.13
835	.20	.31	416	.70	.57	971	.20	.85	502	.70	.18
827	.25	.36	407	.75	.62	962	.25	.90	492	.75	.23
810	.30	.40	398	.80	.66	953	.30	.95	482	.80	.27
811	.35	.45	390	.85	.71	944	.35	.99	473	.85	.32
802	.40	.49	381	.90	.76	934	.40	40.04	463	.90	.37
794	.45	.54	373	.95	.80	925	.45	.08	454	.95	.41

The laws of our state require liquors for medicinal purposes to be sold through the town agent. That these liquors be pure is necessary. The requirements of the United States Pharmacopœia are stated as follows:—

WHISKEY.

Whiskey has an amber color, a distinctive taste and odor, and a specific gravity not above 0.930, nor below 0.917, corresponding approximately with an alcoholic strength of 44 to 50 per cent by weight, or 50 to 58 per cent by volume.

If 100 c. c. of Whiskey be very slowly evaporated in a weighed capsule, on a water-bath, the last portions volatilized should not have a harsh or disagreeable odor (abs. of more than traces of fusel oil from grain or potato spirit). The residue, fully dried at 100° C. (212° F.), should weigh not more than 0.250 Gm., equivalent to 0.25 per cent (abs. of an undue amount of solids). This residue should have no sweet or distinctly spicy taste (abs. of added sugar, glycerin, or spices). It should nearly all dissolve in 10 c. c. of cold water, forming a solution which is colored light green by a dilute solution of ferric chloride (traces oak tannin from casks). 100 c. c. of Whiskey should be rendered distinctly alkaline to litmus by 2 c. c. of the volumetric solution of soda (abs. of an undue amount of free acid).

BRANDY.

An alcoholic liquid obtained by the distillation of fermented grapes, and at least four years old.

Brandy has a pale amber color, a distinctive taste and odor, and a specific gravity not above 0.941, nor below 0.925, corresponding approximately with an alcoholic strength of 39 to 47 per cent by weight, or 46 to 55 per cent by volume.

If 100 c. c. of Brandy be very slowly evaporated in a weighed capsule, on a water-bath, the last portions volatilized should have an agreeable odor, free from harshness (abs. of fusel oil from grain or potato spirit). The residue dried at 100° C. (212° F.) should weigh not more than 0.250 Gm., equivalent to 0.25 per cent (abs. of an undue amount of solids). This residue should have no sweet or distinctly spicy taste (abs. of added sugar, glycerin, or spices). It should nearly all dissolve in 10 c. c. of cold water, forming a solution which is colored light green by a dilute solution of ferric chloride (traces of oak tannin from casks). 100 c. c. of Brandy should be rendered distinctly alkaline to litmus by 3 c. c. of the volumetric solution of soda (abs. of an undue amount of free acid).

GIN.

The foregoing mentioned test for fusel oil is recognized in connection with Gins. A good Gin should not contain an appreciable amount of residue. Its alcoholic percentage should not be greater than 47.8 per cent by volume, 40.3 per cent by weight.

SHERRY WINE.

(WHITE WINE.)

A pale amber-colored, or straw-colored, alcoholic liquid, made by fermenting the unmodified juice of the grape, freed from seeds, stems and skins.

White Wine should be preserved in well-closed, full casks or bottles, and in a cool place.

White Wine should have a full, fruity, agreeable taste, without excessive sweetness or acidity; and it should have a pleasant odor, free from yeastiness. Its specific gravity at 15.6° C. (60° F.) should not be less than 0.990, nor more than 1.010. If 10 c. c. of White Wine be diluted with an equal volume of distilled water and treated with 5 drops of test-solution of ferric chloride, only a faint, greenish-brown color should make its appearance (abs. of tannic acid). Upon evaporation and twelve hours' drying on the water-bath, it should leave a residue of not less than 1.5 per cent, nor more than 3.0 per cent. Using litmus paper as an indicator, 250 c. c. of White Wine should require, for complete neutralization, not less than 15, nor more than 26 c. c. of the volumetric solution of soda.

Tested by the following method, White Wine should contain not less than ten (10) per cent, nor more than twelve (12) per cent, by weight, of absolute alcohol.

Weigh a definite volume of the Wine at the temperature of 15.6° C. (60° F.); evaporate it in a porcelain capsule to one-third of its original volume, cool, and add distilled water until the mixture measures its original volume at the temperature of 15.6° C. (60° F.); then weigh again. The first weight divided by the second will afford a quotient (to be carried out to four decimal places) which corresponds to an alcohol, the percentage strength of which will be ascertained by inspecting the tables.

PORT WINE.

(RED WINE.)

A deep red, alcoholic liquid, made by fermenting the juice of colored grapes in presence of their skins.

Red Wine should be preserved in well-closed, full casks or bottles, and in a cool place.

Red Wine should have a full, fruity, moderately astringent, pleasant taste, without decided sweetness or excessive acidity. It should have a pleasant odor, free from yeastiness. Its specific gravity at 15.6° C. (60° F.) should not be less than 0.989, nor more than 1.010. If 10 c. c. of Red Wine be diluted with an equal volume of distilled water, and treated with 5 drops of test-solution of ferric chloride, the liquid should acquire a brownish-green color, due to tannic acid. Upon evaporation and twelve hours' drying on the water-bath, it should leave a residue of not less than 1.6 per cent, nor more than 3.5 per cent. Using litmus paper as an indicator, 250 c. c. of Red Wine should require, for complete neutralization, not less than 15, nor more than 26 c. c. of the volumetric solution of soda. If

50 c. c. of Red Wine be treated with a slight excess of water of ammonia, the liquid should acquire a green or brownish-green color; if it be then well shaken with 25 c. c. of ether, the greater portion of the ethereal layer removed and evaporated in a porcelain capsule with excess of acetic acid and a few fibres of uncolored silk, the latter should not acquire a crimson or violet color (abs. of aniline colors). With test-solution of acetate of lead, Red Wine should form a heavy precipitate, which may vary in color from bluish-green to green.

Tested by the following method, Red Wine should contain not less than ten (10) per cent, nor more than twelve (12) per cent, by weight of absolute alcohol.

Weigh a definite volume of the Red Wine at the temperature of 15.6° C. (60° F.); evaporate it in a porcelain capsule to one-third of its original volume, cool, and add distilled water until the mixture measures its original volume at the temperature of 15.6° C. (60° F.); then weigh again. The first weight divided by the second will afford a quotient (to be carried out to four decimal places) which corresponds to an alcohol, the percentage strength of which will be ascertained by inspecting the tables.

ALES, BEERS, AND PORTERS.

These differ widely in alcoholic percentage. No two manufacturers, or no two brewings are really identical. They are approximately, however, and the appended table will suffice to give the necessary information concerning these preparations for medical use.

Manufacturer.	Alcohol by weight.	Alcohol by volume.	Per cent Proof Spirit
Scotch Ale	5.97	7.57	13.27
Light Ale	5.92	7.48	13.11
Lager Beer	4.37	5.55	9.72
India Pale Ale	5.92	7.48	13.11
Pabst Lager	4.35	5.55	9.72
XXX Porter	5.64	7.17	12.57
XX	5.33	6.78	11.89
Bass Pale Ale	5.96	7.57	13.27
Guinness Stout	6.18	8.01	14.04
India Pale Ale (Jones)	4.81	6.02	10.54
Brown Stout (Jones)	5.00	6.24	6.78
Lager Beer (Jones)	3.88	4.85	8.51
Extra Stout	6.14	7.66	13.42
Brown Stout	5.77	7.32	12.61

PROOF OF SPIRIT.

Proof Spirit—a term in constant use for purposes of excise—is a diluted spirit which was defined by Act of Parliament (58, George III.) to be “such as shall, at the temperature of 10° C. (51° F.), weigh exactly twelve-thirteenth parts of an equal measure of distilled water.” According to Drinkwater it consists of

Alcohol by weight.....	49.24
Water by weight.....	50.76
	100.00

and its specific gravity at 15.5° C. is 0.91984.

In the analysis of all spirits (seeing that the terms “proof” and “under

proof" are used and known in the trade), the statements of results should always include the percentage of proof spirit.

Spirits weaker than proof are described as U. P., under proof; stronger than proof as O. P., over proof: thus a spirit of 50 U. P. means 50 water and 50 proof spirit; 60 U. P., 60 water and 40 proof spirit. On the other hand, 50 O. P. means that the alcohol is of such a strength, that, to every 100 of the spirit, 50 of water would have to be added to reduce it to proof strength. In all the above the strengths are only good for the normal temperature of 15.5° C.

ESTIMATION OF ALCOHOL.

Specific Gravity 15.5°C.	Absolute Alcohol by Weight Per Cent	Absolute Alcohol by Volume Per Cent	Proof Spirit Per Cent
.9339	42.81	50.37	88.26
.9329	43.29	50.87	89.15
.9319	43.76	51.38	90.03
.9309	44.23	51.87	90.89
.9299	44.68	52.34	91.73
.9289	45.14	52.82	92.56
.9279	45.59	53.29	93.39
.9269	46.05	53.77	94.22
.9259	46.50	54.24	95.05
.9249	46.96	54.71	95.88
.9239	47.41	55.18	96.70
.9229	47.86	55.65	97.52
.9219	48.32	56.11	98.34
.9209	48.77	56.58	99.16
.9199	49.20	57.02	99.98
.9189	49.24	57.06	100.00 P. S.
.9189	49.68	57.49	100.76
.9179	50.13	57.97	101.59
.9169	50.57	58.41	102.35
.9159	50.00	58.85	103.12
.9149	51.42	59.26	103.85
.9139	51.83	59.68	104.58
.9129	52.27	60.12	105.35
.9119	52.73	60.56	106.15

ANALYSES DONE AT LABORATORY OF HYGIENE FROM JANUARY 1, 1898, TO
DECEMBER 1, 1900.

	Diphtheria	Typhoid	Tuberculosis	Malaria	Water	Milk	Beer	Whiskey	Biol. Miscel.	Bact. Miscel.
Addison.....	65	184	92	5	145	8	2	11	1	2
Bennington.....	12	7	38	2	61	4		24		3
Caledonia.....	68	71	80	4	51			51	5	7
Chittenden.....	280	289	346	86	191	34	15	13	5	52
Essex.....		17	9	1	34				1	
Franklin.....	22	43	111	1	80	1	4			1
Grand Isle.....	4		20		4					
Lamoille.....	2	10	50	1	57				2	2
Orange.....	80	14	47	1	21	4		1		6
Orleans.....	9	13	32	1	21	1				1
Rutland.....	273	272	292	27	131	12	6		5	31
Washington.....	361	43	163	3	211	8	42	9	1	18
Windham.....	25	61	151	8	33	6				6
Windsor.....	110	119	85	3	104	4	24			1
	1259	1142	1516	93	1134	77	93	109	20	130

TABLE SHOWING NUMBER OF EXAMINATIONS MADE AND MONEY SAVED
THE STATE OF VERMONT, DURING THE PERIOD FROM
JANUARY 1, 1898, TO DECEMBER 1, 1900.

1289 Diphtheria examinations at \$2.00.....	\$ 2518
1516 Tuberculosis examinations at \$2.00.....	3082
1142 Typhoid examinations at \$2.00.....	2284
1184 Water examinations at \$25.00.....	28850
109 Liquor examinations at \$5.00.....	545
150 Miscellaneous Bacterial examinations at \$2.00.....	900
98 Beer examinations at \$5.00.....	465
98 Malarial examinations at \$2.00.....	186
77 Milk examinations at \$4.00.....	308
	\$37988

ANALYSES DONE AT LABORATORY OF HYGIENE FROM DECEMBER 1, 1900, TO
DECEMBER 1, 1901.

	Diphtheria	Typhoid	Tuberculosis	Malaria	Water	Milk	Beer	Whiskey	Biol. Miscel.	Chem. Miscel.	Bact. Miscel.	Medico-Legal.
Addison.....	5	149	55	4	58	4	5	6	2	1		
Bennington.....	2	4	9	2	51			1				
Caledonia.....	123	40	50	1	41				1		4	2
Chittenden.....	101	150	231	10	119	12	10	10	1	4	13	1
Essex.....		4	4	6	26			6				
Franklin.....	15	34	62		49						1	1
Grand Isle.....	3	13	5		8	2						
Lamoille.....	10	13	37	3	62				1	1		
Orange.....	16	9	32		26		13		1		13	1
Orleans.....	2	5	15	1	41							
Rutland.....	363	123	185	18	75		6	3	3	2	15	4
Washington.....	48	14	115		133	1			1		5	2
Windham.....	66	39	84	8	62				1	1	3	
Windsor.....	42	38	73	4	97	1	11		1		4	1
	796	637	957	57	853	20	45	26	11	9	58	12

TABLE SHOWING NUMBER OF EXAMINATIONS MADE AND MONEY SAVED
THE STATE OF VERMONT, DURING THE PERIOD FROM
DECEMBER 1, 1900, TO DECEMBER 1, 1901.

796 Diphtheria examinations at \$2.00.....	\$ 1592 00
637 Typhoid examinations at \$2.00.....	1274 00
957 Tuberculosis examinations at \$2.00.....	1914 00
57 Malarial examinations at \$2.00.....	114 00
853 Water examinations at \$25.00.....	21325 00
20 Milk examinations at \$4.00.....	80 00
45 Beer examinations at \$5.00.....	225 00
26 Liquor examinations at \$5.00.....	130 00
11 Biological Miscellaneous examinations at \$5.00.....	55 00
9 Chemical Miscellaneous examinations at \$5.00.....	45 00
12 Medico-Legal examinations.....	1875 00
58 Bacteriological Miscellaneous examinations at \$2.00.....	116 00
	\$38745 00

SUGGESTIONS AND INSTRUCTIONS.

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ANALYSES DONE AT LABORATORY OF HYGIENE FROM DECEMBER 1, 1901, TO APRIL 1, 1902.

	Diphtheria	Tuberculosis	Typhoid	Malaria	Water	Beer	Liquor	Tissue	Milk	Bacterial Miscel.	Chemical Miscel.	Medico-Legal
Addison.....	5	15	73	1	19		1	1	2	2		
Bennington.....			2		25			1	3		1	
Caledonia.....	36	19	33		31		26	2		4		
Chittenden.....	8	75	30		35	2	9	9	27	8		
Essex.....			1		15							
Franklin.....	2	22	12		30		2			1		
Grand Isle.....		8								2		
Lamoille.....		12			23		1					
Orange.....	1	13	3		6			2	13			
Orleans.....	3	19			13		1					
Rutland.....	56	85	58	3	27			9	2	9		1
Washington.....	21	30	7		29					6		
Windham.....	23	34	13	1	18					13		
Windsor.....	23	16	15		14	4	1	2		1		1
	178	298	253	5	285	6	41	26	47	46	1	3

TABLE SHOWING NUMBER OF EXAMINATIONS MADE AND MONEY SAVED
THE STATE OF VERMONT, DURING THE PERIOD FROM
DECEMBER 1, 1901, TO APRIL 1, 1902.

178 Diphtheria examinations at \$2.00.....	\$ 356 00
298 Tuberculosis examinations at \$2.00.....	596 00
253 Typhoid examinations at \$2.00.....	506 00
5 Malarial examinations at \$2.00.....	10 00
285 Water examinations at \$25.00.....	7125 00
6 Beer examinations at \$5.00.....	30 00
41 Liquor examinations at \$5.00.....	205 00
26 Tissue examinations at \$2.00.....	52 00
47 Milk examinations at \$4.00.....	188 00
46 Miscellaneous-Bacterial examinations at \$2.00.....	92 00
1 Chemical examination.....	10 00
3 Medico-Legal cases at \$100.00.....	300 00
	<u>\$9470 00</u>

EXAMINATIONS OF BEER.

From January 1, 1898, to December 1, 1900.

Addison.....	2
Chittenden.....	15
Franklin.....	4
Rutland.....	6
Washington.....	43
Windsor.....	24
	<u>93</u>

From December 1, 1900, to December 1, 1901.

Addison.....	5
Chittenden.....	10
Orange.....	13
Rutland.....	6
Windsor.....	11
	<u>45</u>

SUGGESTIONS AND INSTRUCTIONS.

From December 1, 1901, to April 1, 1902.

Chittenden, ...	2
Windsor, ...	4
	6

EXAMINATIONS OF LIQUOR.

From January 1, 1898, to December 1, 1900.

Addison, ...	11
Bennington, ...	24
Caledonia, ...	51
Chittenden, ...	13
Orleans, ...	1
Washington, ...	9
	109

From December 1, 1900, to December 1, 1901.

Addison, ...	6
Bennington, ...	1
Chittenden, ...	10
Essex, ...	6
Rutland, ...	8
	26

From December 1, 1901, to April 1, 1902.

Addison, ...	1
Caledonia, ...	26
Chittenden, ...	9
Franklin, ...	2
Lamoille, ...	1
Orleans, ...	1
Windsor, ...	1
	41

TABLE SHOWING NUMBER OF BEER EXAMINATIONS MADE AND MONEY
SAVED THE STATE OF VERMONT.

From Jan. 1, 1898, to Dec. 1, 1900,	
93 examinations at \$5.00, ...	\$465 00
From Dec. 1, 1900, to Dec. 1, 1901,	
45 examinations at \$5.00, ...	225 00
From Dec. 1, 1901, to April 1, 1902,	
6 examinations at \$5.00, ...	30 00
	\$720 00

TABLE SHOWING NUMBER OF LIQUOR EXAMINATIONS MADE AND MONEY
SAVED THE STATE OF VERMONT.

From Jan. 1, 1898, to Dec. 1, 1900,	
109 examinations at \$5.00, ...	\$545 00
From Dec. 1, 1900, to Dec. 1, 1901,	
26 examinations at \$5.00, ...	130 00
From Dec. 1, 1901, to April 1, 1902,	
41 examinations at \$5.00, ...	205 00
	\$880 00

MALARIAL FEVER AND ITS OCCURRENCE IN VERMONT.

By B. H. STONE, A. B., M. D.

Bacteriologist, Laboratory of Hygiene.

In perhaps no branch of medical science have more interesting, conclusive and practical advances been made than in the knowledge of the remittent and intermittent fevers. The etiology of this class of diseases was long a matter of discussion. The fact that they were more prevalent in swampy regions early led to the conclusion that the marshes produce a mist or gas which, known under the indefinite name, "Miasma," was long thought to be the poison causing the symptoms known as malaria. With the discovery of the bacterial origin of disease the theories became more definite until the discussion became narrowed to three possible channels of infection: (1) through the gastro-intestinal canal with ingested water; (2) through inhaled air (modified miasma theory); (3) by the bites of insects. In this connection a quotation from a book written fifty years ago by a certain Rev. Barney is interesting as indicating that the associations between mosquitoes and malarial regions had even then been noted by a layman, although the significance of the fact was not appreciated. This passage reads as follows: "In plaster and oak cottages, away from the sea, by stagnant pools, the hatching places of clouds of mosquitoes, whence rises with the night the haunting spirit of tertian ague, the hag that rides on and takes life out of the sturdiest men and women, and wastes the vital nerves of the children," etc. The first two theories were abandoned from a failure of any real proof of their truth, while with the perfection of the microscope and the resulting impetus to careful scientific study of the tissues the knowledge of the blood has been greatly advanced and the last theory has been proven.

Now we know that malarial fever or ague is caused by certain animal parasites which live in the corpuscles of the blood, grow, segment, and after destroying the cells within which they have developed attack other corpuscles. Furthermore, we know that the life of the parasite within the human blood is only a part of its complete life history, but that it has two cycles, its sexual and extra-corporeal existence being completed within the body of a mosquito.

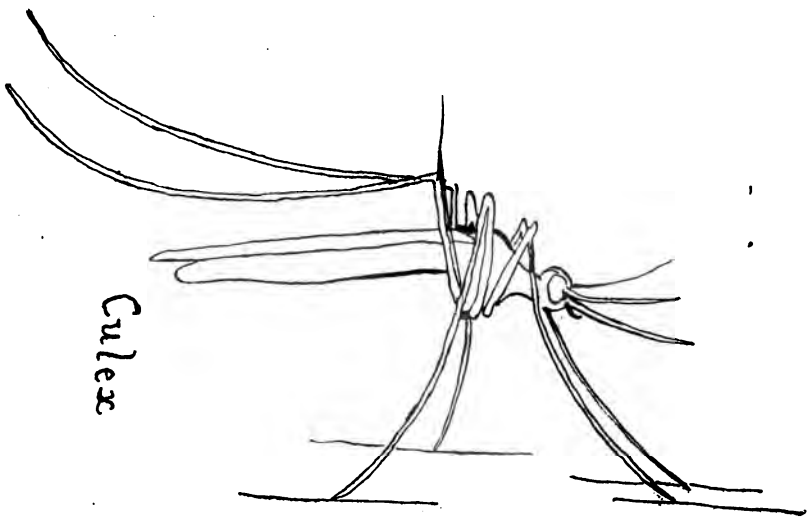
Briefly then the malarial organism possesses two phases of development. Within the human being the ordinary cycle is asexual, ending with segmentation. Sex-ripe forms develop here, and if drawn into the stomach of a mosquito with the blood sucked by the insect, the male element undergoes flagellation, *i. e.*, the development of flagellæ or whips. These flagellæ escape and penetrate the female element. This body then burrows into the walls of the insect's stomach and undergoes a further development, which finally results in the setting free of a swarm of young forms. These new organisms make their way into the salivary gland of the mosquito and are injected with the contents of this gland into the next

person bitten. This cycle within the body of the insect occupies for its completion about one week.

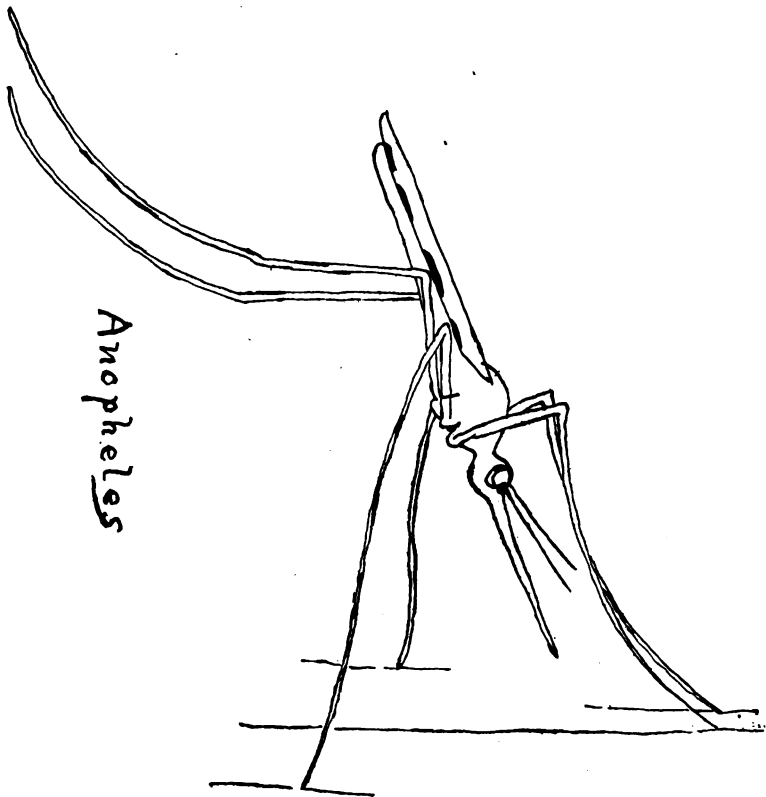
These are not the steps of a theoretical development. Every part of the process has been so carefully worked out and proven that there can be no gainsaying the arguments. Persons have slept through whole seasons in regions where malaria is most prevalent, exposed to the night mists and only protected by mosquito netting, without contracting the disease. Again these people have been bitten by young, freshly hatched mosquitoes with still no ill effects, but when these same mosquitoes have been allowed to bite a malarial patient and again the non-infected person the disease has developed. Furthermore, these insects have been dissected and the malarial organism found, its growth and development watched so closely that we know not only the gross facts, but are able to describe minutely every stage of the extra and intra-corporeal life of the organism.

This extremely important work has been accomplished within a very few years. The mosquito theory was suggested by Knott in 1848, but was first definitely put forward by King in 1883. It was again suggested by Lavernan in 1891, and at about the same time argued by Thebald Smith and Bignami. Experimental proof was, however, lacking until Major Ronald Ross commenced his work in India and later in Sierra Leone at the head of an expedition supported by the Liverpool School of Tropical Medicine. This commission sent out in 1893 did its work so thoroughly that little was left to be proven.

It is seen then that in order to have new cases of malaria there must first be a malarial patient and second the mosquito. With these two factors present any locality may be malarial. But fortunately there is, so far as is known at present, only one variety of mosquito which may act as a carrier for this parasite. Our ordinary mosquito, the *Culex*, does not carry infection. The *Anopheles*, or malarial mosquito, does not breed in open vessels or dishes of water as does the more common variety, but only in stagnant pools in which are growing green water weeds, and it never flies far from its breeding place. They hatch from a larva or wiggler, which lives in the stagnant pools and feeds on the water weed. These larvæ require for their development about a week. They differ from the larvæ of the ordinary variety in the fact that they lie floating at the top of the water, and when disturbed tend to wiggle on the surface with a backward, skating motion, while the larvæ of the *Culex*, which every boy has watched, lie when on the surface of the water suspended by the tails with the heads downward, and when disturbed wiggle at once to the bottom. The mosquitoes which hatch from these larvæ differ from the ordinary *Culex* and can readily be identified. *Anopheles* have a slim, elegant body shaped like that of a humming-bird moth, a small head and a long, thick proboscis. When seated on a wall the axis of the body is almost at right angles to the wall, and they generally have spotted wings (see diagram). The *Culex* has a coarser body with a thick thorax or chest and a thin proboscis. When seated upon a wall the tail hangs downward or even points a little toward the wall and the wings are quite plain.



Culex



Anopheles

The female *Anopheles* alone suck blood. They live for a month or more, and every day or two they fly to the water and deposit their eggs, hence they never fly far from the water. A person once bitten with the infected mosquito becomes a source of danger to others while residing in the vicinity infested with *Anopheles* or malarial-bearing mosquitoes. The organism once gaining entrance to human blood multiplies rapidly. When the numbers have become sufficiently great the symptoms develop. The chill and sudden rise of temperature are due to the sporulation of the organism, a chill occurring at the moment of segmentation. The young spores attack new cells and begin again their life cycle. In case of the most common variety, the tertian, this corporeal cycle is completed in forty-eight hours. The quartan variety requires seventy-two hours for its development, while the æstivo-autumnal variety has an irregular cycle. Cases of malaria with chills coming at intervals other than these may be accounted for by multiple infection.

The practical application of this new knowledge to the realm of preventive medicine is of immense importance. It proves malaria to be first, an infectious, and second, a preventable disease. As an infectious disease cases of malarial fever should be reported to the board of health just as are the contagious diseases, thus enabling precautions against the spread of malaria to be carried out under proper supervision. Of course such precautions are unnecessary in regions where *Anopheles* do not live, but as it is very difficult to prove this fact regarding any locality the safer way is to assume all regions dangerous. These precautions are not onerous when we consider that malaria can be very quickly cured by the use of quinine. This drug is a true parasiticide. It kills the organism.

When all this is done the question of prophylaxis remains largely one of protection against the malarial mosquito. This can be accomplished best by destroying the insect in its larval stage. The most practical way of doing this is by draining all the pools which it is possible to drain, and painting those which remain with kerosene oil. This is done by touching the surface of the water lightly with a rag soaked with the oil. Where it is impracticable to carry out these measures thoroughly much protection can be secured by screening windows and doors. All these means combined cannot fail to do much toward lessening malaria. Many regions which were once considered uninhabitable are now comparatively safe as the result of these measures.

The only absolutely sure method of making the diagnosis of malarial fever is by the discovery of the malarial plasmodium in the blood. For this purpose the blood can be taken anywhere from the capillary circulation, and the best time for taking such specimens is from six to eight hours after a chill or from six to eight hours before the occurrence of another. The Vermont State Board of Health has provided for these examinations at the State Laboratory, and outfits for collecting the blood, together with full directions for making these preparations, are kept at the Laboratory and at the sixty outfit stations through the state. So many physicians have, however, failed to make satisfactory smears that it may not be amiss to

enter a bit into the details of this technique. The end to be sought is the producing of a film of blood one corpuscle thick, in other words a film in which no two corpuscles overlap. With the Laboratory outfits these smears are to be made on cover glasses. To do this a drop of blood should be taken from the ear or finger previously rendered clean and free from grease by the free use of soap and water. A puncture is made and the small drop of blood which exudes without pressure is caught on the middle of one of the cover slides, another cover slide is quickly laid over this in such a way that its corners project from the sides of the first. These slides are then pressed together very gently until only a thin layer of blood is between them. They are then drawn quickly apart by sliding one off the other, using extreme care not to lift them apart. Smears prepared in this way should be dried in the air and sent to the Laboratory, or, if the physician be provided with a microscope with a one-twelfth objective, he may prefer to examine them himself. If so, after being fixed by immersion for one-half hour in a solution of equal parts absolute alcohol and ether, they may be stained by either of the following methods:—

EOSIN AND METHYLENE BLUE STAIN.

Flood the cover glass fixed as above with the following solution:—

Sat. alcoholic sol. of Ehrlich's blood eosin,	1 part.
95% alcohol,	1 part.

After allowing this solution to remain in contact with the preparation one or two minutes, wash in water and replace with the following:—

Sat. watery sol. of Ehrlich's rectified methylene blue.

This last solution, which should be at least one week old is left in contact with the preparation three or four minutes when it should be washed off with water and the smear dried and mounted in balsam. The malarial organism will now be found as a blue body containing more or less black pigment and enclosed within a red corpuscle.

PLEHN'S DOUBLE STAIN.

Flood the slide with the following solution:—

Conc. aq. sol. methylene blue,	60 c. c.
Eosin 5% sol. in 75%,	20 c. c.
Distilled water,	40 c. c.
Sodium hydroxide, 20% sol.	12 Gtts.

As it is impossible to overstain with this solution it may be left on the slide five or ten minutes, after which it should be washed in water and mounted in balsam.

It is possible also to see the organism unstained in fresh blood, but as it is easy to confuse it with some of the normal cells this method is not recommended for any but experts.

The failures which come to us are largely due to carelessness. We are

driven to conclude that a great many times the physician neglects entirely to read the directions accompanying our outfits, for often there has obviously been no attempt to smear the preparation, the drop being allowed to dry as it falls; at other times the covers have evidently been lifted apart. These failures can only be explained on the ground that the physician assumes that he knows all about making the preparation and neglects to read the directions. By failing to make these smears properly he not only puts himself and his patient to a needless inconvenience, but he also takes the time of the microscopist, for an attempt is always made to do something with these specimens.

This question of malaria may seem to contain little of practical interest to the Vermont practitioner, for our state does not bear the distinction of being a malarial region; nevertheless malaria does exist in Vermont. No systematic search for the malarial mosquito has ever been undertaken in this state, but individual insects of the species have been seen by various observers. An army surgeon, who has been stationed at Fort Ethan Allen, reports the finding of a number of *Anopheles* in the barracks at this place. With the number of cases of malaria always existing here among the troops recently returned from the South, we have the second factor necessary to the development of new cases, and such cases have actually developed here among recently enlisted Vermont recruits.

Since the State Laboratory has been in existence we have examined specimens of blood from one hundred and fifty-seven cases of possible malaria. A large proportion of these specimens have been worthless on account of faulty technique in preparation. In thirty-one of these cases malarial organisms have been found. An analysis of the positive cases as given in the following table shows some interesting facts:—

TABLES OF CASES IN WHICH THE *PLASMODIUM MALARIÆ* WAS FOUND.

Variety.	Contracted.					Symptoms.		Total.
	In Ver-mont.	In South	In West	Within one year.	At more remote date.	Typical.	Atypical.	
Tertian.....	10	18	3	23	3	15	11	26
Quartan.....	1		1	2			2	2
Estivo-Autumnal.	1	2		3		2	1	3
Total.....	12	15	4	28	3	17	14	31

It will be seen that twelve of them were probably contracted in Vermont, four in the West, and fifteen in the South. A large proportion of the latter cases occurred among the Spanish-American war veterans. Twenty-eight of the thirty-one cases are of recent origin, having been contracted within one year of the time of the blood examination. Three cases give histories of previous infection at a more distant date. It is very instructive to note that only seventeen of these cases gave the typical symptoms, by



Æstivo-Autumnal Malaria of Vermont Origin. Crescentic Body x 400.
(Photographed by M. J. Wiltse, M. D.)



Æstivo-Autumnal Malaria of Vermont Origin. Crescentic Body x 800.
(Photographed by M. J. Wiltse, M. D.)

which I mean the chill, fever and sweating stages following each other in regular sequence. Of the sixteen cases which did not have regular symptoms, a large number omitted the chill stage, and several had symptoms so absolutely remote from those commonly ascribed to malaria that anyone would be excusable in failing to make this diagnosis. A large proportion of these cases were infected by the tertian organism, only three showing the quartan and two the æstivo-autumnal.

One of these last cases is remarkable in being apparently a case of true Vermont origin. The only other possible source of infection is in a town on Long Island, in which malaria is unknown. After carefully examining the literature on the subject, I have only been able to find one case of this variety of fever reported from New York, hence this possible source detracts little from the uniqueness of the case. Osler says that æstivo-autumnal fever never appears north of the Chesapeake Bay, and Cabot states that he never heard of a case of æstivo-autumnal fever of New England origin.

The accompanying plates show the typical crescentic body found in the blood from this case. The case is so interesting in showing how atypical the symptoms may be in such infections that a report of it as furnished by the physician in charge is inserted here. "Patient P. H., age forty, nationality Danish, occupation quarryman, residence ———, Vt. Came to physician's office September 18, 1901, complaining of general malaise, loss of appetite, some abdominal pain. Had been in this condition about one week previously. No other subjective symptoms. No history of previous sickness. Had been a strong, active, laboring man. Appearance somewhat emaciated, face very sallow, tongue coated white and thickly. Temperature 103, pulse 85, strong and full, respiration 25 (see chart).

diminished for several days before this. Temperature did not rise again above 99° F., and the patient was discharged well October 21, the thirty-fourth day of hospital treatment. Seen again several weeks afterwards and had had no return of the disease. Patient had never had malarial fever before. The town from which patient came is not a malarial region."

These facts and figures are sufficient, I think, to show that we must consider the possibility of malarial infection in many of our obscure fever cases. The very fact that malaria is rare in Vermont has a tendency to put the physician off his guard, while the fact that many of these cases are of remote infection and consequently atypical in their symptomology is still further confusing. There is no doubt that many cases are overlooked, and these cases residing in the community where mosquitoes are present may become the source of other cases. While this danger is not alarming it is still worthy of our consideration, and I wish to urge upon the Vermont physicians the desirability of having a blood examination in these doubtful cases. It costs you nothing and may be of value to you even though in a negative way. This is an era of medical progress, when no means of making diagnosis more sure can afford to be neglected.

BACTERIAL CHANGES IN WATER.

The following table is inserted to show the actual changes which occurred in samples of water standing in our regular outfit bottles.

Two of these samples, A and C, were kept at ordinary room temperature (approximately 70° F.) and exposed to light. The other two samples, B and D, were kept in the ice chest (at a temperature of approximately 45° F.) and protected from the light. All the samples were agitated every day at the time the plates were made. The frequent agitation may have influenced in some degree the bacterial growth and similar tests on waters kept quiet would be interesting. However, as the primary object of this series of experiments was to ascertain the probable changes which occur in samples received here from distant parts of the state and of course subject to much shaking in transportation these results are more valuable.

A glance at the tables will show the importance of an immediate delivery of the samples collected for examination.

BACTERIAL CHANGES IN WATER.

Surface Waters.				Ground Waters.			
A. Exposed to Light 70° F.		B. Kept in Dark 45° F.		C. Exposed to Light 70° F.		D. Kept in Dark 45° F.	
Time from Collec- tion.	No. bac- teria per c. c.	Time from Collec- tion.	No. Bac- teria per c. c.	Time from Collec- tion.	No. Bac- teria per c. c.	Time from Collec- tion.	No. Bac- teria per c. c.
0 days	1900	0 days	1500	1 days	200	1 days	200
1 "	2000	1 "	1700	6 "	1000	6 "	4000
2 "	4600	2 "	2200	7 "	12200	7 "	8600
3 "		3 "	10500	8 "	18000	8 "	5100
5 "	6400	5 "		9 "	10200	9 "	8400
6 "	8400	6 "	25100	10 "	27000	10 "	2200
7 "	10000	7 "	26000				
8 "	10200	8 "	40200				

A RAPID METHOD OF DETECTING BACILLUS COLI COMMUNIS
IN WATER.

By B. H. STONE, A. B., M. D.

The following method, or combination of methods, for the bacteriological examination of water, has been used in the Laboratory of Hygiene of the Vermont State Board of Health for the past four or five months. We think it possesses an advantage of greater rapidity and simplicity over other methods and, so far as we have been able to discover, it gives accurate results. In the search for *Bacillus coli communis* we have found the scheme especially useful. It only requires seventy-two hours to be sure of the presence of this organism, while specimens which do not contain glucose-fermenting bacteria can be declared negative in twenty-four hours.

METHOD.

So soon as the water is received, steps should be taken to gain the following results: (1) An estimate of the total number of bacteria per cubic centimeter. (2) A determination of the presence or absence of *Bacillus coli communis*. (3) If this organism is present, an estimation of the number of bacilli per cubic centimeter.

Estimation of the Total Numbers.—The bottle containing the water is thoroughly agitated and 1 c. c. of the contents diluted by means of a sterilized pipette with 99 c. c. of distilled water previously measured and sterilized in an 8-ounce bottle. The mixture is made thorough by shaking the bottle violently 25 times; 1 c. c. is then taken from the diluted specimen by means of a sterilized pipette and mixed with a tube of plating agar melted at a temperature of 40° C.

This agar, containing 0.01 c. c. of the original water, is then turned into a sterilized four-inch Petri dish and allowed to solidify on a level table. The plate is placed in a room temperature incubator (22° C.) and grown for 96 hours when it is removed and the number of colonies on the plate are counted. This number multiplied by 100 represents approximately the number of individuals per c. c. of the original water.

Determination of the Presence of Bacillus coli communis.—*A.* A Smith's tube filled with 2% glucose bouillon is inoculated with 1 c. c. of the water to be examined and grown 24 hours at 38° C. If no gas is formed, the absence of the colon bacillus is shown.

B. If from 25% to 70% of gas is formed in the closed arm, a tube containing 10 c. c. of neutral broth to which has been added 0.3 c. c. Parietti's solution is inoculated with 0.5 c. c. of the contents of *A* and grown 24 hours at 38° C.

C. A second Smith's tube is inoculated with 0.5 c. c. of the contents of *B* and grown 24 hours at 38° C. (If there is no gas, we may be sure the gas producer in *A* was not the colon bacillus.) If, on the other hand, gas is produced in this tube, we may be reasonably sure that the *Bacillus coli communis* is present.

D. Further confirmation may be obtained by ascertaining the gas formula from *C*. The formula for the colon group is $H/CO_2-2/1$, further.

E. A pure culture can be easily obtained from *B* by plating and the following reactions obtained: (1) Gelatin stab does not liquify after seven days at 22° C. (2) Litmus milk reddens and coagulates in 24 hours at 37°. (3) Dunham's solution: Indol formed in three days at 37° C. (4) Morphology in bouillon: sluggishly motile (?) bacillus.

Estimation of Numbers of Bacillus coli communis.—At the same time the plates for total numbers are made, a litmus lactose agar plate of 0.5 c. c. of the original water is made. After solidifying, this plate is inverted and grown 24 hours at 38° C., when the colonies of *Bacillus coli communis* may be identified as red colonies on a blue plate.

The following organisms have been subjected to this method, but only *Bacillus coli communis* and the allied bacillus of hog cholera survive the check solution *B* and grow in the second fermentation tube: *Bacillus pyocyaneus*; *Bacillus prodigiosus*; *Bacillus cloacæ*; *Bacillus liquefaciens*; *Bacillus aërogenes capsulatus*; *Bacillus* of lactic acid; *Bacillus lactis aërogenes*; *Bacillus coli communis*; *Bacillus* of hog cholera. *Bacillus coli communis* from many sources has been tried and in all cases survived the process.

Up to date we have had 550 specimens of water put through this process and we have yet to find an organism surviving the check solution and growing with gas production in the second fermentation tube, which does not give every typical growth reaction characteristic of *Bacillus coli communis*.

LABORATORY WORK ON PRIVATE WATER SUPPLIES.

BY C. P. MOAT, CHEMIST, LABORATORY OF HYGIENE.

Very few people have such an opportunity for the sanitary analyses of foods, water, etc., as those of us who live in Vermont. However, it seems that this advantage is only slightly appreciated by many of the persons of the state. Take, for example, the question of the purity of the private and domestic water supplies. In this case all that is necessary for a person of the state, who wishes an analysis made of his well or spring, is to apply to the health officer of the town for the proper outfit, which on request of the latter will be forwarded to the proper parties with instructions as to the filling and returning. The only charge for the examination is the express charge on the full outfit to the Laboratory. Think what an opportunity this is. The expense in most places for a sanitary analysis of water being twenty-five dollars, it would seem as if few of our inhabitants took advantage of their great opportunity in finding out the purity of the water used by them. By this I mean the private supplies, as the public systems are analyzed at frequent intervals. Surely our people have no cause for drinking water that has not been tested and if they still continue to use polluted water, it is their own fault. However, far worse than using impure water knowingly, is the practice of using bad water for the washing of milk utensils that are used for transporting milk to other places, and thus subjecting to danger those unsuspecting persons who use the milk.

Would it not be of value to the health officer to know that the people of his town were drinking water that had been tested? Then he could turn to the suspicious waters at once in case of any outbreak.

Following are some of the results of the private wells and springs analyzed during 1901 with some of our interpretations of the same. Aside from the analyses of the public supplies done at the Laboratory during 1901, we have had two hundred and thirty-three samples of private supplies for analysis.

Good	Suspicious	Contaminated	
16	38	21	Shown by both Chemical and Bacterial examinations.
48	80	74	Shown by Chemical examination.
66	58	41	Shown by Bacterial examination.

Besides these, there are thirty-two waters which show effect of previous contamination by chemical results and of these the bacterial examination shows eight to be well filtered and safe at the time of examination. From these results it would seem as if attention should be given to many of these sources.

In the following table No. 1 shows the results of an analysis of a spring water proven good by both chemical and bacterial examination. Even though this is so now, it may not be so always, and it is proper to have "good" waters analyzed at times, more or less frequent, so as to know if they are constantly so or whether surface water, drought, or other abnormal conditions affect them.

Parts per Million.			Odor			Residue			Ammonia		Cl	Nitrates	Nitrites	Hard.	B. Coll.	Bacteria per c. c.
	Turbidity	Sediment	Color	Cold	Hot	T. S.	L. I.	F. S.	Free	Alb.						
No. 1	very slight	slight	.00	none	none	42.0	6.0	36.0	.000	.010	.8	.070	.000	29.9	none	300
No. 2	none	very slight	.00	"	"	74.0	7.0	67.0	.008	.060	.7	.530	.000	62.0	pres.	700
No. 3	"	"	.00	very faint	faint	206.0	60.0	146.0	.014	.082	22.0	7.000	.002	102.0	none	100
No. 4	slight	slight	.00	faint	"	88.5	25.0	63.5	.030	.080	11.0	1.000	.000	54.0	"	10200
No. 5	none	very slight	.00	none	none	72.0	10.0	62.0	.008	.064	1.0	.480	.000	54.0	"	3000
No. 6	distinct	slight	.00	musty	disagreeable	137.5	29.0	108.5	.022	.090	2.8	.800	.008	94.0	"	200
No. 7	"	considerable	.02	distinct	decided	184.0	23.0	161.0	.166	.110	2.0	.960	.015	186.0	pres.	8600
No. 8	slight	slight	.00	none	none	24.0	2.5	21.5	.006	.100	.9	.220	.000	20.0	"	66000
No. 9	"	considerable	.10	"	"	485.0	146.0	339.0	.096	.120	45.0	28.000	.012	300.0	none	200
No. 10	none	very slight	.00	"	"	152.0	46.0	106.0	.002	.082	9.0	8.200	.001	70.0	"	200
No. 11	decided	heavy	.00	"	"	262.0	68.0	194.0	.002	.046	19.0	7.600	.000	175.0	pres.	3600

No. 2 shows a well water good chemically but bad bacterially, having the *Bacillus coli communis* (sewage bacteria) present, thus rendering the water unfit for domestic use.

No. 3 shows a spring water good bacterially but not chemically. Nos. 2 and 3 show the value of having both chemical and bacterial examinations made on waters.

No. 4 shows a well water suspicious from both chemical and bacterial standpoints. It contains too high a number of bacteria and shows odor, too high an amount of free ammonia, while the chlorine and nitrates are both too high.

No. 5 shows a water good chemically, but the number of bacteria makes it suspicious.

No. 6 shows a water very suspicious from a chemical point of view but good bacterially.

These suspicious waters, either totally or partially, are reported as such with the advice to carefully examine the surroundings and have another analysis made at a little later time. Many times the cause of the suspicion may be only a temporary one and attention to the environment may discover the cause and remedy the same.

No. 7 shows a spring water that is contaminated chemically and bacterially, having color, odor, high ammonias, nitrites, many bacteria and *Bacillus coli communis*.

No. 8 and No. 9 show contamination either chemically or bacterially.

These last three kinds of water are reported as being contaminated and unfit for domestic use.

No. 10 and No. 11 are results from wells and show a class of waters which at some earlier time have been polluted, but in their subsequent passage through the ground have been purified. These are reported as showing previous contamination and they may or may not be safe at the present time, depending on the results of the bacterial examination.

No. 10 is a water that shows previous contamination, but the subsequent passage through the ground has made it safe at the time of its examination, only two hundred bacteria per c. c. being present.

But No. 11, while the chemical results indicate previous, rather than present, contamination owing to the lack of odor, low free ammonia and nitrites, the results bacteriologically show present contamination and condemn the sample as containing a high number of bacteria and *Bacillus coli communis*, thus indicating imperfect filtration.

With this class of waters, frequent analyses are advisable as the filtering material is unknown to us, thus differing from experimental filters, and therefore the only means of judging whether or not the filter is working properly is by means of frequent examinations, and by the people of Vermont these are easily obtained.

In the following table are the results of analyses of milk done for the health officer of Burlington since the ordinance was passed which requires, among other things, the milk to be up to a standard of fat 4%, ash 7%, and total solids 12.5%. The percentage of fat required in this act will be seen to be higher than the standard set by the Vermont law.

Total number of samples 34.

Number below standard in fat requirement 17.

Number below standard in total solids 12.

Laboratory Number.	Total Solids.	Ash.	Fat.	Laboratory Number.	Total Solids.	Ash.	Fat.
15963	12.22	.7	4.00	16089	14.42	.8	4.30
15964	12.25	.7	4.10	16282	12.97	.6	4.15
15965	11.98	.7	2.75	16283	12.72	.5	3.95
15974	12.36	.7	3.70	16364	12.83	.7	3.65
15975	12.74	.7	4.60	16397	11.14	.6	3.40
16006	12.59	.7	4.45	16398	11.88	.7	3.60
16007	12.85	.7	4.15	16399	12.00	.8	3.60
16008	13.07	.7	4.30	16400	11.97	.8	3.30
16012	10.31	.6	2.05	16401	13.94	.7	4.75
16018	12.67	.7	3.55	16430	12.69	.6	3.80
16028	12.08	.7	3.55	16431	12.00	.6	3.50
16029	14.32	.9	4.50	16459	11.83	.7	3.80
16030	13.19	.7	4.10	16460	12.85	.8	4.00
16031	12.96	.7	4.00	16461	11.67	.7	3.35
16032	13.40	.8	4.00	16487	13.12	.7	4.20
16078	12.48	.7	3.70	16488	12.51	.6	4.05
16088	13.30	.7	4.30	16490	12.73	.7	3.95

VACCINATION AND COMMON SENSE.

An Address Delivered at the Annual Meeting of the Subscribers to the Hospital Saturday Fund at the Mansion House on March 22, 1902.*

By T. D. ACLAND, M. D. OXON., PHYSICIAN TO ST. THOMAS HOSPITAL.

[Reprinted from the British Medical Journal.]

LADIES AND GENTLEMEN:—A great responsibility has been imposed upon you: that of judging in what way you will endeavor to protect yourselves and your children against smallpox. It is a duty which you owe to the great community, of which each one of you is a member, to come to a right decision, and you cannot avoid the responsibility.

I can well believe that, with all the conflicting and inaccurate statements

* This address is published by request, in the hope that it may prove useful to some who have not time to review the facts for themselves. In its original form it was delivered to a non-medical audience, and some alterations and additions have been necessary. Even with these it is felt to be very incomplete. It was illustrated by lantern slides of cases of small-pox, and by some of the diagrams which have been here reproduced. The writer owes and offers his thanks to many friends for much assistance, without which the work would have been impossible. Especially to Dr. Bond, of Gloucester; Dr. Newsholme, Medical Officer of Health for Brighton; Dr. Copeman; Dr. Harley Brooks, of the Mile End Infirmary; Mr. Jones, of the Statistical Department of the Metropolitan Asylums Board; Dr. Dawson Williams, Dr. Edwardes, Dr. McVail, and many others.

which are made about vaccination, you must find it difficult to arrive at any sound conclusion on the subject.

I thank you for the opportunity which you have given me of putting before you some of the evidence, which has been sufficient at any rate to convince myself, that of all the weapons which have been devised for fighting smallpox, vaccination is the most efficient and the least harmful, and that there is absolutely no known substitute.

It has been maintained that other means, such as sanitation and quarantine, are more effectual safeguards against the disease than vaccination, and that to these is due the diminution in the death-rate from smallpox which has taken place during the last century.

As I shall show you, this diminution in the fatality from smallpox is in this country mainly in the early years of life. If it were due to sanitation, the same beneficial results ought to be shown in the death-rate from other diseases which are rightly considered as infantile disorders. But this is not the case. On the contrary, although the share of smallpox mortality borne by children (under five years of age) diminished greatly between 1851 and 1880, during which years vaccination was made compulsory, there is no corresponding diminution in the share of the death-rate in children of the same age from other infantile disorders, such as measles, scarlet fever, diphtheria, etc. The actual figures are given in the following table, quoted from McVail,¹ which shows how the contributions made by children under five years of age to the total mortality from each disease have altered.

TABLE I.—*Showing that if the death-rate as given at all ages be taken as unity, then the death-rate for children under five years of age will be as follows:**

	1851-60.	1861-70.	1871-80.
From all causes	8.0	8.0	2.9
“ <i>small-pox</i>	4.7	4.0	2.2
“ measles	6.8	6.8	6.8
“ scarlatina	4.7	4.7	4.8
“ diphtheria	4.0	4.1	8.9
“ whooping-cough	7.2	7.2	7.1
“ fevers (including typhus, typhoid, and ill defined)	1.5	1.4	1.8
“ diarrhoea	4.9	5.6	6.1

* Calculated from pp. 112-114 of the Registrar-General's Supplement to the Forty-Fifth Annual Report, 1871-80.

It will be seen that whilst the proportion of deaths from smallpox contributed by infants has so greatly diminished, there is no corresponding diminution in the other infantile disorders mentioned, and in two the proportion is actually greater.

It would seem then probable, at any rate, that there must be some other agency than sanitation at work to account for the diminution in the infantile death-rate from smallpox. It has been suggested that quarantine and the isolation of all those who have been exposed to the infection of smallpox would suffice to stay a local outbreak; but in any large community such

means are impossible and hopelessly inadequate, and must break down as they did under the very limited strain of the local outbreak at Leicester in 1893; and even if they were adequate, it is difficult to see why the protection should be exerted especially on the children and not on the adults, since smallpox was, and now is, amongst the unvaccinated, a disease falling with special severity on the earlier years of life. There must be some other factor at work. I will endeavor to lay before you some of the evidence there is to show that this factor is vaccination.

You will hear all kinds of bad things said about vaccination, of which I will tell you a few.

1. It is said that, as vaccinia and smallpox are totally distinct diseases, it is impossible for vaccination to protect against smallpox.

2. That vaccinia is nothing but smallpox artificially transmitted through the cow, and that statistics show that not only does vaccination not protect against smallpox, but that it actually causes that disease.

Now I think you will admit, in fact we must all admit, that these statements, being diametrically opposed to each other, cannot both be true; I will only, therefore, add a few words of practical criticism on each of them.

As to the first statement, "That vaccination cannot protect against smallpox because it is a totally distinct disease," every one who thinks at all will allow that, if it can be shown that vaccination does in fact afford protection, this objection falls to the ground.

As to the second point, "That vaccination does not protect against smallpox but actually causes the disease," I can speak with some confidence, since for seven years I was Medical Officer to the Royal Commission on Vaccination, and was engaged in making inquiries into vaccinal injuries throughout the length and breadth of the kingdom. During that period many millions of vaccinations were performed, and I have never seen or heard of an authentic case of smallpox resulting from vaccination in this country.

3. There is still a third objection which is frequently urged against vaccination, namely, that the harm done by it and the risks which it involves are so great that there is no justification for a practice productive only of evil and powerless for good.

If you will have patience with me, I will endeavor to show you how very far from the truth both these statements are. Before doing so, however, I should like to say that we know, even if all goes well, that a vaccinated child suffers something, and is an increased care and anxiety to an often overworked mother. No one can sympathize more than I do with the trouble and distress which may thus come to mother and child through the second week of even a normal vaccination. Sometimes, when all does not go well—when there is inflammation of the arm, or ulceration of the pocks—the burden thus imposed on the mother is heavier, and the suffering to the child is greater, and in some few instances the injury may be severe. It cannot be denied that in the case of a working man such trouble in the house may be a serious one, and it must be looked upon as a sacrifice, which he is asked to make for the good of the state as well as for the good of his child.

To return to the consideration of vaccinal injuries. Calculating from the cases which were brought under the notice of the Royal Commission on Vaccination during the years 1889-96, and from the cases inquired into during 1888-91 by the Local Government Board, it would appear that there was death or serious injury in one case in about 14,000 primary vaccinations.² You may say that even this amount of harm ought not to be, and the fact that it does occur is a powerful argument against vaccination. Before accepting this conclusion you must take into consideration that more than half (57.6 per cent) of these cases resulted from preventable causes—that is, from one or other of the various forms of inflammation. Further, when you consider the ease with which the vaccine pocks may be injured, rubbed, or fouled, and when you consider the terrible conditions under which, unfortunately, thousands of our fellow working men have to live, it is hardly to be wondered at that an open wound like vaccination does sometimes go wrong.

All things occasionally go wrong in this imperfect world, and wherever you turn you will find a certain amount of penalty has to be paid for everything we have, however valuable and beneficent it may be. Gas explosions, railway accidents, ship-wrecks, fires, all contribute something to the sorrow and suffering of the world, yet no one in his senses would give up gas, or railways, or ships, or houses because some injury is caused and some lives are lost by their use. Surely it is a question of degree. It is no use in the presence of an enemy discarding a weapon because you fear it may not be absolutely free from danger to yourself, unless or until you have something better to substitute for it. In case of smallpox there is no substitute, and if you discard vaccination you are left defenceless and without any protection but flight in the presence of a relentless foe. It cannot even be pretended that the practice of vaccination hinders the adoption of every other useful means of combating smallpox.

When first I began to consider these questions seriously, I cast about for something with which the risk caused by vaccination (infinitesimally small though it really is) might fairly be compared, and I came to the conclusion that the use of anæsthetics (chloroform and ether) was on the whole the greatest blessing which my profession had ever been able to confer on suffering mankind. Now, as you are all aware, a certain number of deaths occur every year through the use of anæsthetics; this is quite unavoidable. The percentage number of deaths from chloroform is nearly seven times as great as that from the complications or accidents of vaccination. The deaths from ether are considerably fewer than from chloroform, but, even so, the total directly traceable to anæsthetics is considerably greater than that resulting from vaccination.

It is interesting to compare the numbers of vaccinal injuries with the fatality from smallpox (even in a mild epidemic) where the practice of vaccination has been allowed to lapse. In Leicester, during the outbreak of 1891-92, 100 unvaccinated children were attacked, of whom 12 died. Thus in this community (with an unvaccinated child population), with all the boasted safeguards of isolation and sanitation, as many children died from

smallpox as, according to the calculation given above, might be estimated to die or to suffer from serious injury amongst a like number of children (100) in 1,580 years, or in about 169,908 vaccinations. During this same epidemic only two vaccinated children under 10 years of age were attacked by smallpox, neither of whom died.

In a severe epidemic, such as that at Gloucester (1895-96), not fewer than 279 unvaccinated children under 10 years of age died out of 680 attacked (41 per cent). Such fatality would not occur in less than *three million* primary vaccinations, and a very little calculation will show that the risk of a fatal issue amongst those attacked was just 6,000 times as great as from vaccination. Comment is unnecessary, but the facts are deserving of serious study. They seem to me to show quite clearly that, although there is a certain amount of risk in vaccination, the risk is so small that it is one which should be readily faced if it can be shown that vaccination is for the good of the individual and for the benefit of the state. A great deal has been written and said about the serious nature of the risks, but they are in fact very small, and are such as the members of my profession readily incur for themselves, their wives, and their children, for though they know them better than anyone else can know them, they judge them to be, as they are, insignificant as compared with the risks of smallpox.

It is the duty of every one of us, as far as in us lies, to prevent ourselves from becoming the centers of infection. As you are the judges in this case, and have to decide for yourselves whether vaccination is capable of affording protection against smallpox, it is only right that you should consider the credibility of the witnesses who bring forward their evidence for or against the practice. Every one will, I think, allow that if they want a good pair of boots they should go to a bootmaker, and if they want a good loaf of bread they should go to the baker; and similarly it might be expected that those who wish to learn about smallpox and its prevention would be wise to go to those likely to possess the most accurate knowledge of the disease, namely, those who have spent their lives in the practical study of smallpox.

You will find that the unanimity of opinion expressed by those who have so spent their lives as to the effect of vaccination is very striking, and that those who are opposed to vaccination are, almost without exception, those who have no very practical acquaintance with smallpox. There are arm-chair generals even in medicine, who prefer to sit at home and deal out what they consider destructive criticism to those who are in the midst of the fight rather than to be up and doing something for the good of the individual and the welfare of the community.

MEANS WHICH MIGHT BE ADOPTED FOR DECIDING THE QUESTION AS TO WHETHER, AND IF SO TO WHAT EXTENT, VACCINATION PROTECTS AGAINST SMALLPOX.

The question as to whether or not vaccination protects against smallpox, and if so in what degree, may be approached in various ways:—

1. By vaccinating first, and inoculating with smallpox afterwards, a test

which cannot, of course, be made in the present day, but I shall refer to this again.

2. By observing the effect of vaccination on particular groups of persons exposed to the contagion of smallpox under more or less similar conditions.

3. By observing the comparative frequency with which smallpox attacks the vaccinated and unvaccinated in large communities, the degree of the severity of the attack in each of these classes, and the resulting death-rate.

4. By observing the effect of vaccination upon the age at which smallpox is most prevalent amongst those who have been vaccinated in infancy and among those who have not.

May I here, in parenthesis, say what I mean by vaccinated? I mean efficiently vaccinated. It is well known that vaccination in infancy gives its most effective protection only for a certain number of years. It is necessary to bear this in mind, since there are many fallacies based on statements made to the effect that in adult life more vaccinated than unvaccinated persons suffer from smallpox. This statement is one of those falsehoods masquerading in the guise of truth, which, as I shall show-later on, has but little justification, since a child vaccinated in infancy, although, in fact, vaccinated, does not continue to benefit to any large extent from the vaccination after from seven to ten years; and as regards liability to attack from smallpox, insensibly approximates to the condition of those who have not been vaccinated.

1. The method of testing the efficacy of vaccination by the subsequent inoculation of smallpox is, of course, now out of the question, since inoculation is forbidden by law; but it was frequently adopted by Jenner, who, in 1801, wrote "that upwards of 6,000 persons had been inoculated with the virus of cowpox, and that the far greater part of them has since been inoculated with that of smallpox, and exposed to its infection in every rational way that could be devised, but without effect." This was, at any rate, an experimental inquiry on a sufficiently large scale, and, even if the problem was not capable of being finally solved in this manner, was sufficient to convince his contemporaries of the efficacy of vaccination.

2. The second method of attempting to estimate the utility or the reverse of vaccination is to study its effect upon limited communities living under approximately the same conditions. There cannot be any better illustration than the experience of the staffs of the various smallpox hospitals.

They are as follows:—

In Highgate Smallpox Hospital, from 1836 to 1896—a period of no less than 60 years—I case of smallpox, and 1 only, occurred among the hospital staff, and he was the gardener, least exposed to infection, but not re-vaccinated. During the years 1883-1896 there were 137 nurses and attendants employed; 30 of these had previously had smallpox, but none of the others had suffered from the disease.⁴

At the Sheffield hospitals the staffs numbered 143; of 80 who were re-vaccinated as adults, not one contracted smallpox, whilst of 62 who had not been revaccinated 6 suffered from smallpox, as did one other who was not successfully revaccinated until he was sickening from the disease.

At Warrington, Homerton, and Fulham the experience has been similar. I will not weary you with the details of these; it would not serve any useful purpose, since they merely confirm the conclusion that even the nurses, who are exposed to a concentrated form of infection, such as probably we never have to encounter, can be and are protected against smallpox by the simple expedient of revaccination.

To come down to quite recent experience. During the third week in February of this year a statement appeared in the daily press to the effect that out of a staff of 43 nurses employed in the Mile End Infirmary, 35 were revaccinated and have not suffered from smallpox, whilst of the other 8 who were not revaccinated 7 had already contracted the disease.

Such a statement was not likely to be accepted without criticism and challenge, and, thinking it would be a good test case to put before you from the practical and common-sense point of view, I inquired into the facts, and I am sure that I may tender in your name, as well as my own, our best thanks to Dr. Harley Brooks, the medical officer of the infirmary, for the great amount of trouble which he has taken to reply fully to my inquiries.

The facts are as follows:—

Early in January, 1902, there were 40 nurses and 2 matrons on the staff of the Mile End Infirmary, and 1 nurse on sick leave, a total of 43; not one of them had had smallpox previously; of these 31 had been revaccinated at various dates up to two years before the outbreak. Four were revaccinated on January 28 and 29 (2 of them unsuccessfully). None of these 35 contracted smallpox. Of the remaining 8, 1 was away on sick leave, leaving 7, who all suffered from smallpox. Of these, 3 were not revaccinated, and the remaining 4 all sickened with smallpox in two days (2 cases), three days, and six days respectively after vaccination. Thus these 4 cases were incubating smallpox at the time they were revaccinated, and though it may not be strictly correct to say that none of the vaccinated cases suffered from smallpox, it is certain that none of the cases who were revaccinated before infection contracted the disease, and all the cases who suffered from smallpox were either unvaccinated or revaccinated only during the incubation period of the disease.

I may say here that vaccination within a short time after exposure to the infection of smallpox may be of some use in mitigating the attack, but that if delayed until the incubation period is advanced it may be expected to exercise little or no influence on the result.

A similar and very striking object lesson may be learned from the records of the smallpox hospitals of the Metropolitan Asylums Board.

During the year 1901, amongst the patients admitted to these hospitals were 21 persons who had been employed in disinfecting work; not one of these had been revaccinated since infancy. I have made careful inquiries, and I am informed that not a single person, engaged in work similar to that of the 21 persons mentioned above, who had been properly revaccinated, is known to have been admitted during this period (1891). And further, that no official of the Board, all of whom are revaccinated when they commence their work, had suffered from smallpox during the year 1901.

Nine other cases were admitted to the Board's hospitals suffering from smallpox contracted in the discharge of their duties as sanitary inspectors, dustmen, and undertakers; of these, 5 had not been revaccinated, 1 was said to have been revaccinated 40 and 1 19 years ago, and 1 without success 4 years ago.

Further, during 16 years, 1884-1900, more than 2,000 persons have been employed in the smallpox hospitals of the Metropolitan Asylums Board; of this large number—some few of whom, no doubt, were protected by a previous attack—only 17 contracted smallpox, though constantly exposed to infection. Of these, 4 are known to have escaped revaccination, and the remaining 13 are known to have been revaccinated after having been exposed to infection. From the dates at which the eruption appeared in these cases it is practically certain that every one of them had contracted smallpox before their revaccination could possibly have taken effect. Lastly, not one of the staffs of the hospital ships has ever died of smallpox, and not one has even suffered from the disease for the last 8 years (1893-1901).

During 20 years, 1881-1901, the Board's ambulance service has employed over 1,250 persons; of these 4 have contracted smallpox, 1 was unvaccinated and died, 1 had been unsuccessfully vaccinated and died, 2 only had been duly revaccinated—they both recovered.

These are remarkable facts, and do not seem to me to justify any other conclusion than that these persons, constantly exposed to infection in a virulent form, were protected from the disease, not by sanitation, not by isolation, not by any of the various remedies which have been suggested, but solely by efficient vaccination and revaccination such as is open to every one to obtain.

Before leaving this branch of the subject I should like, with your permission, to call your attention to three tables, which show the relative liability to contract smallpox, to suffer severely, and to die from it amongst the vaccinated and unvaccinated respectively.

N. B.—*In all the following tables, under "vaccinated" are included all cases vaccinated in infancy, although after the age of from 7 to 10 years they ought rather to be classed as "unvaccinated," because the protective influence of vaccination very rapidly diminishes.*

TABLE II.—*Showing numbers of attacks and deaths amongst those exposed to smallpox in certain outbreaks inquired into by Dr. Coupland (Lancet, 1897, vol. i. p. 511).*

	Vaccinated.			Unvaccinated.		
	Exposed.	Attacked.	Died.	Exposed.	Attacked.	Died.
Under 1 year :						
Dewsbury	16	1	0	59	24	16
Leicester	1	0	0	32	7	2
Gloucester	14	0	0	153	80	56
1 to 10 years :						
Dewsbury	400	48	1	254	133	31
Leicester	77	2	0	251	98	10
Gloucester	258	24	1	1,178	537	192
10 to 30 years :						
Dewsbury	1,125	341	5	294	141	19
Leicester	438	104	0	96	47	3
Gloucester	1,649	539	30	102	55	18
30 years and over :						
Dewsbury	833	187	7	68	15	4
Leicester	321	64	1	9	3	1
Gloucester	1,465	465	64	42	17	9
Age uncertain :						
Dewsbury	21	—	—	—	—	—
Leicester	9	—	—	—	—	—
Gloucester	—	—	—	—	—	—

This table shows that in three separate towns children who had been vaccinated were far less liable to attack from smallpox, and, if attacked, much less liable to die from it, than those who were unvaccinated. After 10 years of age, as I have said, the protection becomes less, and revaccination is necessary. It will be seen that 766 vaccinated children under 10 were exposed to infection in the 3 towns, and that 70, or about 1 in 10, only were attacked, of whom 2 only died; whilst amongst the unvaccinated, 1,927 were exposed, of whom 874 were attacked, and of these 307 died; that is, proportionately, nearly 4 times as many unvaccinated as vaccinated were attacked, and 60 times as many died.

The next table shows much the same thing, in rather less detail, but in each case with an enormous advantage on the side of the vaccinated.

It shows that the vaccinated at all ages were in these places less liable to attack than the unvaccinated, and that under 10 years of age, where the vaccinated are *more fully protected*, the unvaccinated were about 7½ times more liable to *attack* by smallpox than the vaccinated.

Towns.	Date of Epidemic.	Attack-rate under 10.		Attack-rate over 10.	
		Vaccinated.	Unvaccinated.	Vaccinated.	Unvaccinated.
Sheffield	1887-88	7.9	67.6	28.3	53.6
Warrington	1892-93	4.4	54.5	29.9	57.6
Dewsbury	1891-92	10.2	50.8	37.7	53.4
Leicester	1892-93	2.5	35.3	22.2	47.6
Gloucester	1895-96	8.8	46.3	32.2	50.0

* Final Report of the Royal Commission on Vaccination, p. 65.

TABLE III.—*Smallpox attack-rate of vaccinated and unvaccinated persons,*

under and over 10 years of age, in five towns in which smallpox epidemics have recently occurred.*

The following diagram, lent by Dr. Newsholme, and taken from the figures given above, shows graphically the number of *attacks* and *deaths* in each 100 persons residing in houses known to have been infected by smallpox at Sheffield during the epidemic of 1887-1888.

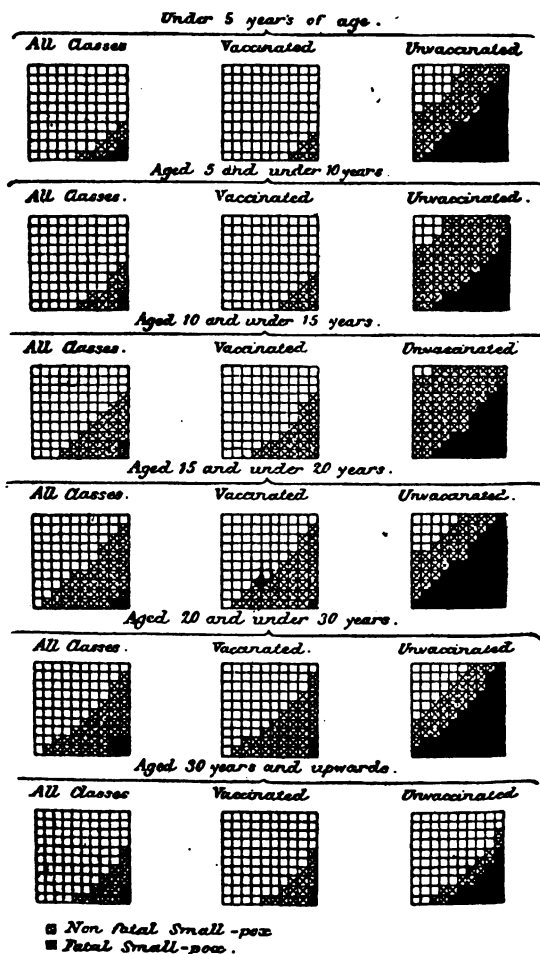


DIAGRAM I.—Showing in regard of persons residing in the houses of Sheffield reported to have been invaded by smallpox, the incidence of smallpox attack and of smallpox death, up to the date of enumeration, upon each hundred of all classes, and upon each hundred vaccinated and unvaccinated respectively, at each of several age-periods.

In the following table and diagram the relative severity of attack amongst the vaccinated and unvaccinated are shown. The table is taken from the report of the Royal Commission on Vaccination, the diagram is from *A Study of 972 Cases of Smallpox*; by Dr. J. B. Russell, late Medical Officer of Health for the City of Glasgow.

TABLE IV.—*The incidence of mild and severe cases of smallpox on each hundred of vaccinated and unvaccinated persons attacked during five recent smallpox epidemics.**

Local Epidemics.		Mild.	Severe.
London	Vaccinated.....	89.0	11.0
	Unvaccinated.....	35.2	64.8
Sheffield	Vaccinated.....	82.8	17.2
	Unvaccinated.....	18.5	81.5
Dewsbury	Vaccinated.....	82.0	18.0
	Unvaccinated.....	23.1	76.9
Leicester	Vaccinated.....	81.4	18.6
	Unvaccinated.....	27.2	72.8
Warrington	Vaccinated.....	78.2	21.8
	Unvaccinated.....	29.4	70.6

* Final Report of the Royal Commission on Vaccination, pp. 69-70

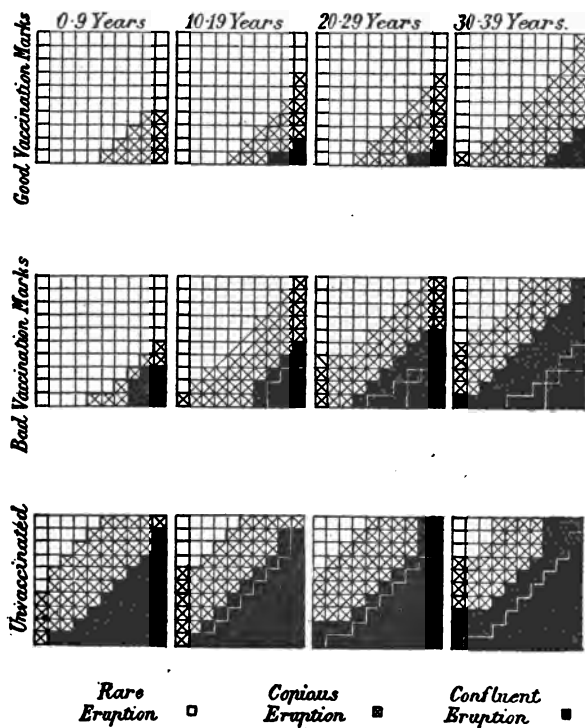
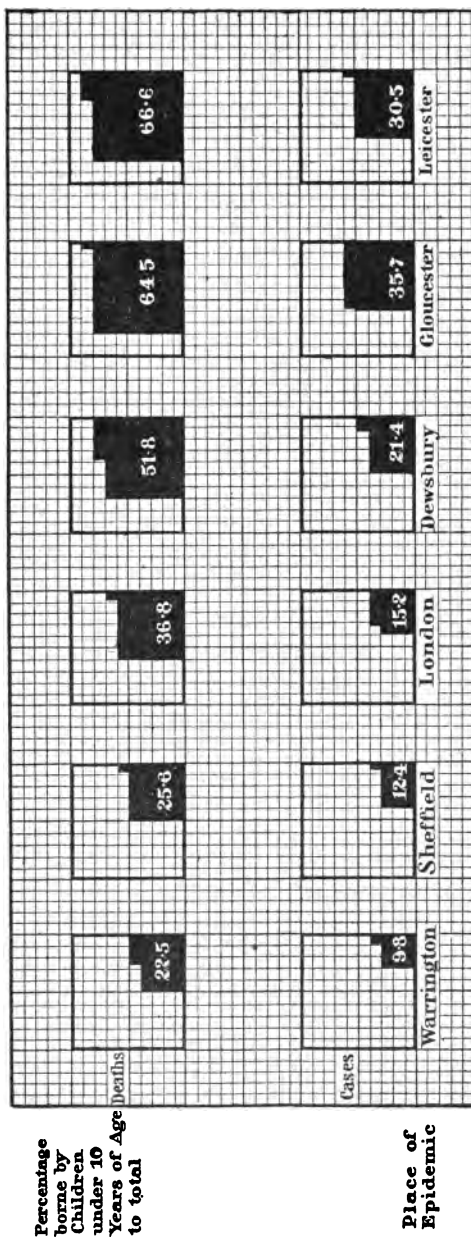


DIAGRAM II.—*From Dr. J. B. Russell's "A Study of 972 Cases of Small-pox," showing the severity of the eruption of smallpox among patients with good vaccination marks, among patients with bad vaccination marks, and among unvaccinated patients, at each of the ages 0-9 years, 10-19 years, 20-29 years, and 30-39 years*

There is, unfortunately in this country, no obligation on the part of an adult to be revaccinated; consequently, as might be expected, the maximum evidence of the protective influence of vaccination is shown in the early years of life. Smallpox used to be a disease of childhood, and is so now where there is a neglect of infant vaccination, as is shown by the next table and diagram, where it will be seen that the number of deaths in every 100 children under 10 years of age increased in direct proportion to the neglect of infant vaccination.

DIAGRAM III.—*Showing that the percentage of cases and of deaths occurring in children under 10 years of age varied in the towns named directly in proportion to the neglect of vaccination.*



Date of Epidemic	1892-3	1887-8	1892-3	1891-2	1895-6	1892-3
Dimensions of Epidemic { Cases	661	4677	2353	1012	1970	357
Deaths	62	496	182	110	434	21

TABLE V.—*Child mortality from smallpox in relation to the neglect of vaccination in six towns which have recently suffered from smallpox epidemics.**

Town.	Date of Epidemic.	Total of Smallpox Deaths.	Percentage of Total Deaths from Smallpox borne by Children under 10 Years of Age.	Vaccination Default.
Warrington.....	1892-93	62	22.5	Very slight.
Sheffield	1887-88	589	25.6	Very slight.
London	1892-93	182	36.8	In 1883-91, 10 per cent.
Dewsbury	1891-92	110	51.8	In 1882-92, 32.3 per cent.
Gloucester.....	1895-96	443	64.5	In 1885-94, 10.6 to 85.1 per cent.
Leicester.....	1892-93	21	71.4†	In 1883-92, 43.8 to 80.1 per cent.

* Final Report of the Royal Commission on Vaccination, pp. 50 and 176.

† Excluding the deaths of 8 patients in a scarlet fever ward in close proximity to the Smallpox Hospital, this proportion would be reduced to 66.6.

The same facts are shown in a graphic form in Diagram III (see above) drawn up by Dr. Newsholme from the above figures.

The importance of vaccination in infancy is well shown by what happened in London last year.

During the year 1901 there were admitted into the hospitals of our Metropolitan Asylums Board 113 children under the age of 10 years. Of these, 12 had been vaccinated, and not one of them died. Ninety-five were unvaccinated, and of these 52 died, whilst there were 6 doubtful cases, all of whom died.

The details are given in the following table:—

TABLE VI.—*Showing the number of completed cases of smallpox amongst the "vaccinated" and "unvaccinated" and "doubtful" treated in the hospitals of the Metropolitan Asylums Board during the year 1901.**

—	Ages.	Vaccinated.		Unvaccinated.		Doubtful.	
		Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
London, 1901 {	0-5	1	0	61	39	2	2
	5-10	11	0	34	13	4	4
	—	12	0	95	52	6	6

* Report of Statistical Committee, Metropolitan Asylums Board, January 10, 1902.

The same relative immunity amongst the vaccinated as compared with unvaccinated children is shown in Table VI, who were attacked and died in the epidemics at Gloucester⁴ (1896) and Middlesbrough (1898).

TABLE VII.

	Vaccinated in Infancy.			Unvaccinated.		
	Attacks.	Deaths.	Fatality.	Attacks.	Deaths.	Fatality.
Middlesbrough.....	43	0	0	62	29	46.7
Gloucester.....	26	1	3.8	513	215	41.9
	69	1	1.44	575	244	42.4

In Tables V. and VI. the number of attacks and deaths from smallpox in children under 10 in London, Gloucester, and Middlesbrough, are given, and it is shown that the proportion of deaths amongst the unvaccinated is enormously greater than amongst the vaccinated. But it will be also seen that whereas at Gloucester the number of cases amongst the unvaccinated was 26 times as great (680 to 26; see note 4 at end) as amongst the vaccinated, in London the proportion was about 8 times (95 to 12); and in Middlesbrough it was only $1\frac{1}{2}$ times (62 to 43) as great. If the London cases under 20 are taken, it will be seen that the numbers are by some strange coincidence equal (161).

TABLE VIII.—*Showing the cases of smallpox under 20 years of age admitted and treated either to recovery or death in the hospitals of the Metropolitan Asylums Board during the year 1901.**

Ages.	Vaccinated.			Doubtful.			Unvaccinated.		
	Cases.	Deaths.	Mortality per cent.	Cases.	Deaths.	Mortality per cent.	Cases.	Deaths.	Mortality per cent.
Under 1.....	—	—	—	—	—	—	17	15	88.24
1—5.....	1	—	—	2	2	100.00	44	24	54.55
5—10.....	11	—	—	4	4	100.00	34	18	52.94
10—15.....	42	1	2.38	3	1	33.33	41	14	34.15
15—20.....	107	2	1.87	3	—	—	25	18	72.00
Total under 20.....	161	3	1.86	12	7	58.33	161	79	49.07

* From the Report of the Statistical Committee of the Metropolitan Asylums Board, January 10, 1902.

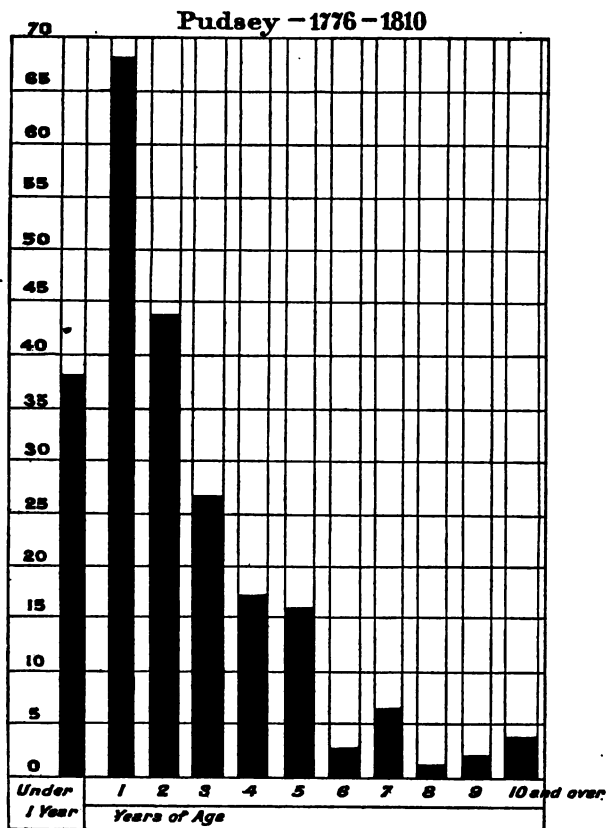


DIAGRAM IV.—(Hunter.)—*Showing the enormous proportion of deaths which occurred from smallpox in the earlier years of life in communities unprotected by vaccination.*

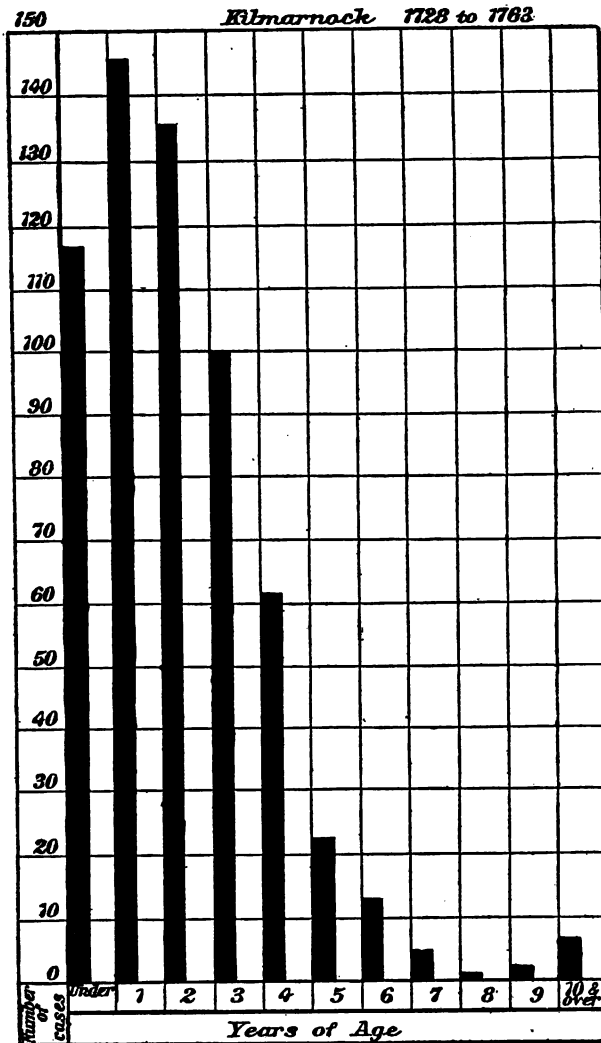


DIAGRAM V.—(McVail.)—Showing the enormous proportion of deaths which occurred from smallpox in the earlier years of life in communities unprotected by vaccination.

Again, if reference is made to Table I., it will be seen that, as is generally found, if the cases at all ages are taken together, the number under the head of "vaccinated" is considerably greater than under "unvaccinated." This fact has not escaped the notice of those opposed to vaccination, and has been

used as an argument to show that vaccination is useless. It really only shows that vaccination in infancy does not give (as is well known) life-long immunity from smallpox.

The following considerations deserve attention:—

1. After the age of 10 the immunity afforded by vaccination in infancy has become materially lessened, consequently after that age an individual who has not been revaccinated is very imperfectly protected. This point has been touched upon above.

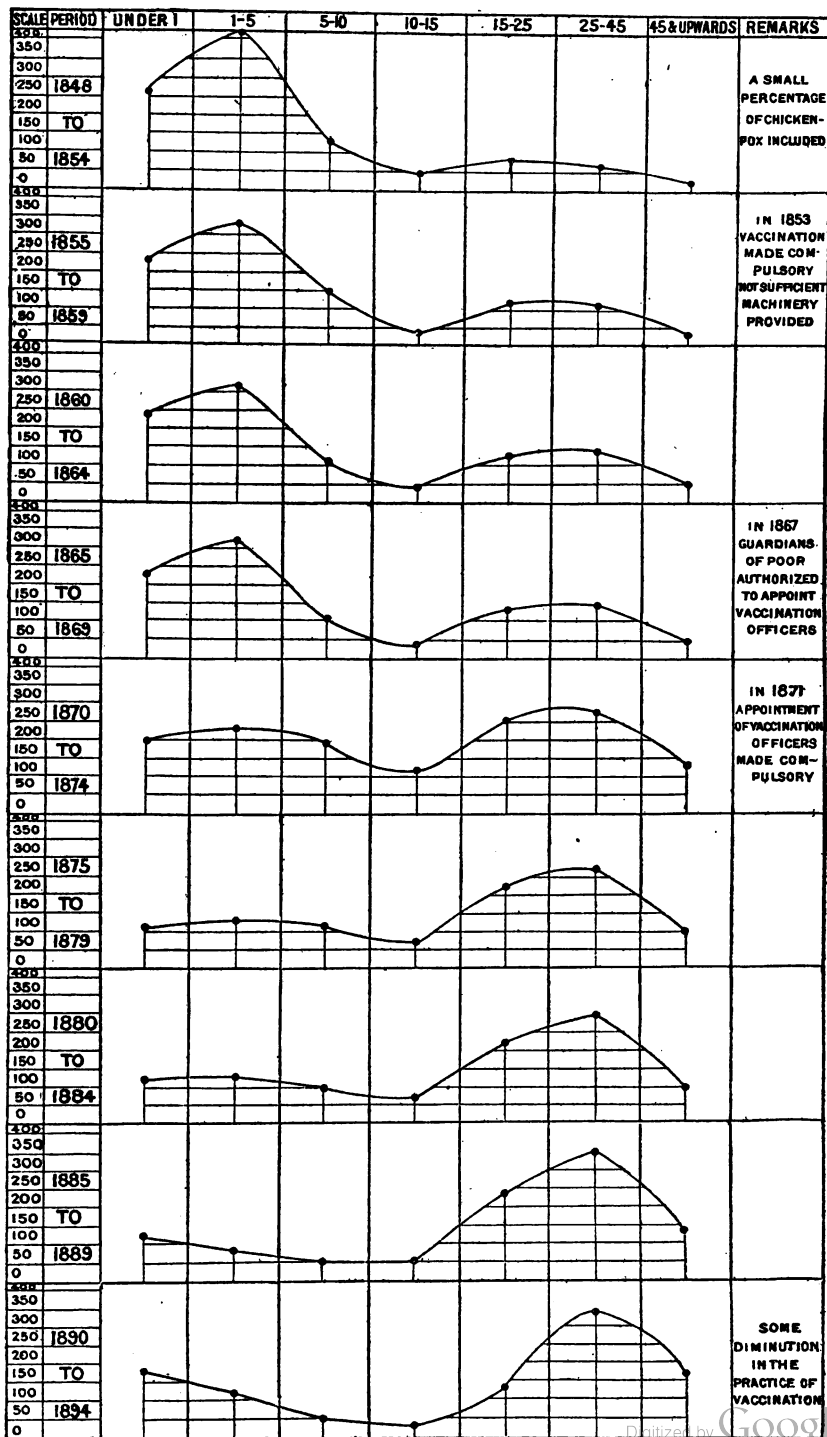
2. The better a community is vaccinated, the more nearly will the numbers of attacks in each class "vaccinated" and "unvaccinated" approximate to one another. A little reflection will show the probability of this, if, in fact, any protection is afforded by the operation. For instance, if in a given town there are 1,000 children, of whom 900 are vaccinated and 100 are not—a vaccination default which was found in London for many years—and in each class there were 20 cases of smallpox, this number would represent 20 per cent of the unvaccinated and rather more than 2 per cent of the vaccinated; so that, although the actual number of cases of smallpox in the two classes was the same, the fact would be that proportionately ten times as many of the unvaccinated would be attacked as of the vaccinated.

Again, supposing the conditions were altered, and the community was badly vaccinated, so that there were equal numbers of unvaccinated and vaccinated. If the ratio of attack were the same as before, there would be 100 cases amongst the unvaccinated and 10 amongst the vaccinated. This is the clue to the solution of the difficulty. In Gloucester the vaccination default between 1885-94 varied from 10 to 85.1 per cent. Middlesborough was well vaccinated. In the former town there were 680 cases of smallpox with 279 deaths amongst the unvaccinated, and 26 attacks and 1 death amongst the vaccinated; in the latter town there were 63 attacks and 29 deaths amongst the unvaccinated, and 43 without one death amongst the vaccinated. In London, where the default of vaccination was intermediate between the two, there were 95 attacks and 52 deaths amongst the unvaccinated to 12 attacks with no death amongst the vaccinated.

The frightful mortality amongst the unvaccinated children attacked—namely, in round numbers, 46, 41, and 58 per cent—shows that in these outbreaks amongst the infected children, at any rate, smallpox had lost none of its virulence; the mortality amongst children which occurred in pre-vaccination times may be gathered from the two diagrams (IV. and V.) which are given for comparison on pp. 48 and 49. These show the total number of deaths from smallpox at each age up to 10; at Pudsey, 1776-1810 (Hunter), and at Kilmarnock, 1728-63 (McVail).

The tables which have been quoted all tell the same tale in different ways. They show: (1) That the vaccinated are less liable to attack after exposure to smallpox; (2) that they are less liable to suffer severely or to die if attacked; and (3) where the ages are specified they show that the maximum protection amongst the vaccinated is found in the early years of life, and that the maximum incidence of smallpox amongst the unvaccinated is in childhood. If, in fact, the diminution in the mortality from

ENGLAND AND WALES.—Deaths from smallpox at certain age periods to 1,000 deaths from smallpox at all ages.



smallpox amongst children is due to the effect of vaccination, it should be possible to show that it is coincident with and proportionate to the efficient performance of the operation. This is comparatively easy.

DIAGRAM VI.—*Prepared by Dr. Newsholme from data given in the Final Report to the Royal Commission on Vaccination, p. 47. It shows that in proportion as infant vaccination became more general, so did the deaths from smallpox decrease during the earlier years, and proportionately increase during adult life. The increased ratio of deaths in children corresponding to the increased vaccination default 1885-94 is well shown. The average vaccination default in London was as follows: 1875-1879, 7.8; 1880-1884, 6.5; 1885-1889, 9.0; 1890-1894, 17.5. These numbers are taken from the Report of the Medical Officer to the London County Council, 1900, p. 17.*

Diagram VI. gives the incidence of the deaths from smallpox at different ages from the year 1848 to 1894 inclusive. It does not indicate the actual number of cases of smallpox, but only the proportion out of every 1,000 cases which would fall on each age period. It will be seen at a glance that in proportion as vaccination was efficiently carried out, so did the maximum stress of smallpox cease to fall on the early years of life, and was being transferred to the later years, when the protection afforded by infant vaccination would in most instances have been lost. Diagram VI. does not give the gross mortality from smallpox, which is shown for the years indicated in the following chart.

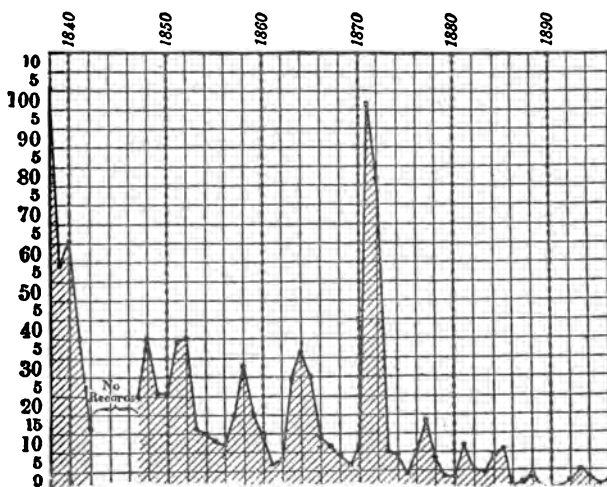


DIAGRAM VII.—*Showing gross mortality from smallpox at all ages from the time when the official registration of mortality commenced (1838)—in*

proportion to every 100,000 persons living at the time. During the four years 1843-7, for some unexplained reason, the causes of death, including, of course, smallpox, were not published by the registrar-general. Quoted in "The Effects of Vaccination in Infancy," etc., Jenner Society, Gloucester, from Newsholme's "Vital Statistics," 1899 (p. 210).

The facts on which the above diagram is founded have never been disputed; they have, indeed, been used in the attempt to prove that "vaccination is a delusion." If the whole of the facts, or even the essential facts, are represented in the diagram, it would at first sight appear that there is ground for the contention, since in the years of the great pandemic, 1870-71, the total deaths from smallpox rose to a higher point than at any period during the last half of the nineteenth century, notwithstanding that vaccination was in 1853 made compulsory—without, however, the provision of any sufficient machinery for enforcing it—and that in 1867 the guardians were authorized—not compelled—to appoint vaccination officers. It required the severe lesson of 1870-71 to force on the executive the necessity for making the appointment of vaccination officers compulsory. Thus, at first sight it would seem as though vaccination had not really done anything to check the epidemic.

Now as to the facts:

1. The mortality in 1870-71, which was higher than at any period during the last fifty years, was exceeded in no fewer than ninety-three years during the eighteenth century (McVail); so that for some reason or other there has been a great diminution in the gross mortality from smallpox.

2. The diagram does not give any indication as to the incidence of the disease; it does not show whether the mortality was greatest amongst infants or adults, amongst the vaccinated or unvaccinated.

3. It has been shown that during the eighteenth century and at the present day amongst the unvaccinated smallpox is a disease falling with special severity on children (see Diagrams IV., V., and Tables VI., VII., and VIII.).

4. Unless for some reason or other the age incidence of smallpox has altered, it should be found that, as was the case previous to the introduction of vaccination, the proportion of deaths amongst children in 1870-71 exceeded that amongst adults.

5. A glance at Dr. Newsholme's diagram shows that this is not the case; on the contrary, there is a steady diminution in the ratio per 1,000 of deaths borne by the early years of life, and a steady proportionate increase in the deaths borne by adults. This diminution continued as vaccination became more and more efficiently performed, and ceased again with the neglect of vaccination.⁵

More remarkable still is the fact that the proportion of adult deaths in the period 1870-74 (including the years of the epidemic 1870-72), was greater, and the proportion of infant deaths less, than at any previous period included in Dr. Newsholme's diagram.

The chart (Diagram VII.) in reality shows nothing more than that there

was during the years 1870-71 an enormous increase in the total deaths from smallpox; it gives no indication of the fact that the stress of the disease did not, as formerly, fall chiefly upon the children, of whom a considerable proportion had been vaccinated, but that it fell on adults most of whom were either unvaccinated or had outlived the immunity which had been conferred by vaccination in infancy.

The foregoing statement and the facts and figures which I have laid before you show with great clearness that both in small and in large communities, in hospitals and out of them those who are protected by vaccination not only resist infection from smallpox more easily, but suffer less severely when attacked, and more often recover than those who neglect this means of defence, which is offered freely to every one.

It has incidentally been shown that the so-called risks of vaccination are infinitesimally small, and that vaccination and revaccination at about the age of ten years should be universally practiced if the nation is to be effectively protected.

I have taken my evidence, not from foreign lands and from those who live under conditions different from our own, but from the everyday life of our own country and from the experience of those who are in charge of our own hospitals. They all tell the same tale. They all tell of a powerful means of defence against a relentless foe. It is for you to judge whether you will avail yourself of the protection which you have at hand, or expose yourselves without defence to the horrors of a disease of which, fortunately, so few of us have had practical experience.

I have very few more words to add, but they are worthy of your earnest consideration.

First, it is of the utmost importance that, if you or your children are vaccinated, the operation should be performed efficiently, that is, with a sufficient area of vesicles.

It is sometimes pretended that it does not matter whether there are one, two, three, or four marks: It matters a great deal. The amount of protection afforded by vaccination is closely related to the area of the vesicles, and the making of one, two, or three small pocks is not sufficient to give lasting protection; it is merely trifling with the operation, and many certificates of so-called successful vaccination are nothing better than an official sanction of what is known to be of very little value, and ought to be illegal.

Second, the lymph used should be pure and effective.

It can hardly be credited that a nation which is so very careful that the margarine tub shall not be labeled "butter" can be so indifferent and careless as to the source, manufacture, and sale of the lymph with which vaccinations are carried out by others than the public vaccinators. We should unite in demanding the establishment of laboratories adequate to supply all who require it, with a lymph prepared in the best possible way, by the most accomplished experts, and that inspection and inquiry into the source and manufacture of all lymph, whether imported or made in this country, should be made.

It is much to be desired that the nation should take up this matter and urge

the central authority to make arrangements for an adequate supply of lymph. We are told by Mr. Long that the Government does not intend to supply lymph from the National Vaccine Establishment to all who require it. He says that an ample supply can be obtained from private makers. Much of this lymph may be very good, but in a matter of this kind, which is of national importance, it is desirable that the preparation, quality, and efficiency of the lymph should be under the strict supervision of that department of the Government which exists for the preservation of the health of the people.

NOTES AND REFERENCES.

¹ *Trans. Epidem. Soc. Lond.*, N. S., vol. xvi, 1896-97, p. 155. * It is stated, para. 408 Final Rep. R. C. V., "that it is not possible to fix with absolute certainty the number of deaths connected with vaccination," but during the years 1881-89 in England one death in 14,159 primary vaccinations was associated with vaccination in the certificate. In Scotland the proportion was much less. During the years 1888-90 it was only 1 to 38,872. * Final Report of the Royal Commission on Vaccination, p. 85. * There were 1,411 cases of small pox at Middlesbrough, and the first 1,411 cases which occurred at Gloucester are taken for comparison. If the whole number at Gloucester—1,979 cases—were taken, the numbers under 10 years of age would be 680 cases and 279 deaths; fatality, 41.0 per cent. * The exact numbers indicating the extent of the vaccination default in London up to date are not available, so I have been obliged to take the vaccination defaults for twenty years previous to and inclusive of 1898. The average number of children not finally accounted for during these years as regards vaccination was in London 14.35 per cent. * The average vaccination default for London was: 1875-79, 7.5 per cent; 1880-84, 6.5 per cent; 1885-90, 9.0 per cent; 1890-94, 17.5 per cent.

BULLETIN OF THE VERMONT STATE BOARD OF HEALTH.

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CASES OF CONTAGIOUS DISEASES REPORTED TO THE SECRETARY OF THE STATE BOARD OF HEALTH FROM JANUARY 1 TO MAY 20, 1902.

Counties.	Small-pox.		Measles.		Scarlatina.		Typhoid Fever.		Diphtheria.		Whooping Cough.		Meningitis.		Erysipelas.	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Addison...			10		10		25	2	1							
Bennington	1		1				15		1		15					
Caledonia...			49		10		25	1	18	1	58					
Chittenden	74	1	290		23		7	3	1		8	1				
Essex.....	1		1		2	1			7	1		1				
Franklin...	21		13		45	5	11	2	6	1	4					
Grand Isle.	4		19		4											
Lamoille...	8		9		37				1		119	1				
Orange.....	2		11		40	1					7					
Orleans....			13		15		15	2	2							
Rutland....	10	1	196	1	99	2	2		27	2	31		5			
Washingt'n	1		84		64	3	2	1	11	2	70				1	1
Windham...			327		18		2		4	1	10				8	
Windsor....			299		13	1	2	1	3		14				8	
Total.....	124	2	1322	3	880	13	106	13	82	8	331	3	5		7	1

The foregoing table is not complete, as we are sure that there has been a failure on the part of local health officers to report cases; in a few cases this has been wholly the fault of the health officer, but in a large majority of cases it has been owing to negligence on the part of the attending physician, or the head of the family. See Section 4684 Revised Laws. The attention of local health officers is called to the last paragraph of this section, which they should see is enforced. A few prosecutions would cause compliance with this section, which would make these statistics of value. It is

impossible to make accurate deductions from this table as we do not know how many cases have never been reported. We note that smallpox has made its appearance in all but four counties; by vaccination and strict quarantine it has been confined to the places where it has broken out, except in one or two cases, where it was not reported until after others had been exposed. We would call attention to the article from the British Medical Journal, by Dr. T. D. Acland, upon vaccination; it should be read with great care.

Measles has prevailed in every county. It is probable that not half the cases have been reported. Whooping cough has been reported from all but four counties. Comparing the reported cases of this disease with reported cases of measles we find that there have been four times as many cases of measles as of whooping cough, yet there have been as many deaths from the small number of cases of whooping cough as from the large number of cases of measles. In how many cases in both of these diseases the foundation has been laid for subsequent affections that either incapacitate in some measure or prove fatal, it is impossible to estimate. The same is true of scarlatina, which has occurred in all but one county. Typhoid fever in all but four counties. Diphtheria in all but two, although there are four counties which have had only one case each.

These facts call for greater efficiency on the part of local health officers in establishing and maintaining an effective quarantine, and in seeing that *all* cases are reported. The law imposes upon these officers the duty to see that the head of the family, or attending physician, makes these reports.

There is something for these local guardians of the public health to do in ferreting out the causes that have led to the development of so many cases of typhoid fever and diphtheria. Is the first due to a polluted water supply? or the second to unrecognized cases that pass for tonsillitis?

NEWS ITEMS.

Efficacy of Diphtheria Antitoxin.—The use of Prof. Behring's diphtheria serum has resulted, according to statistics just published, in the lowest death-rate ever recorded from diphtheria in Berlin, in 1901. The deaths from diphtheria were then 469. Prior to the introduction of Prof. Behring's serum the deaths from this disease ranged from 1,300 to 2,600 a year. In all but one of the Berlin hospitals the serum treatment is in use. In these the mortality is from 12% to 13%, whereas in the one hospital where it is not used the mortality is 64.7%.

Liquor Traffic in Germany.—A resolution adopted by the Prussian Diet requests the ministry to prepare a bill restricting the liquor traffic. It is claimed that Germany suffers a great injury through the excessive use of alcoholic beverages. One-third of all the inmates of her insane asylums are said to be victims of intemperance, while 80% of the idiots are the offspring of intemperate parents. It is estimated that the enormous sum of 3,000,000 marks (\$750,000,000) is spent in a year for drink.

Porto Rico has a population of about 960,000, and for ten years prior to American occupation, as shown by careful statistics of the Spanish, there were 621 deaths per annum from smallpox alone. As soon as the American troops took possession the entire territory was divided into districts and the whole population was carefully vaccinated under the supervision of the medical officers. This work was completed July 1, 1899, and since that date only three deaths have occurred in Porto Rico from smallpox. This work was done under military regulation, and hence can be considered wholly reliable and accurate. This shows a saving of over 6,000 human lives in ten years' time, besides the great expense attendant upon the care of the sick comprising a much larger number, as only a certain per cent of those attacked with smallpox died. There is probably no more positive proof of the value of compulsory vaccination than this in the whole history of the great discovery of the immortal Jenner. The report shows that out of 960,000 inhabitants 860,000 vaccinations were performed, requiring four months' time, and 87½ per cent were successful, the virus being taken from a farm established on the island for the purpose.

Smallpox in the United States, as officially reported from December 28, 1901, to April 18, 1902, amounts to 29,304 cases with 850 deaths. The total for the corresponding period in 1901 was 16,734 cases with 225 deaths.

The Philadelphia Press says: "If smallpox is ever to be stamped out of this country it will have to be fought unitedly, and not single handed. There will have to be a general and vigorous effort all along the line made to that end. Immunity from the disease for many years has made not only the United States but other countries also careless, and this carelessness is now being paid for by a wide prevalence of the disease. A general vaccination all over the country and strict regulations enforced by state and national authorities are the only means adequate to meet the emergency."

The following report is made of the experiments of Prof. Kinnicut in purification of sewage by septic tank process. The sewage treated was the ordinary city sewage of Worcester. The tests indicate: (1) That about one-fourth of the solid matter is removed by septic tank; (2) that the tank removes a large amount of iron from acid iron sewage; (3) that 25 per cent of suspended matter was removed, which is much less than that removed from sewage, with less manufacturing waste; (4) that 21 per cent of soluble matter was removed; (5) that temperature had nothing to do with the organic matter removed, while gas evolved is less in winter than in summer; (6) that the amount of gas depends upon the sludge at the bottom of the tank; (7) that the sludge contains less organic matter in autumn than in the spring; (8) that the crust contains much more organic matter than the sludge and that the crust is an incident rather than result of bacterial action.

Experiments to Prevent Plague.—Drs. V. C. Vaughn and F. G. Novy, of the University of Michigan, expect to leave for Asia about the middle of June, upon an expedition to India for testing the efficacy of benzozone,

an organic peroxide which is believed to be a cure and a preventive of typhoid fever, cholera, plague, dysentery and all other diseases the seat of which is in the intestines.

Tuberculosis in Cattle and Man.—Professor Behring in his forthcoming book on tuberculosis in cattle, details the results of six years' investigations at Marburg, where he was assisted by Drs. Ruppel and Roemer. He affirms that tuberculosis in man and cattle is propagated by identical bacilli, and that the seeming differences between human and bovine bacilli result from the capacity of the bacilli to accommodate themselves to the organism in which they live. He reaches the conclusion that, chemically and physiologically, tubercle in man and cattle are of the same species. He has successfully infected cattle with virus from human beings, producing fatal tuberculosis by vaccinating cattle when they are young. This he declares to be his greatest discovery. The method is in use on farms at Marburg.

Discussion by Dr. Fred Fletcher, Bradford; Dr. L. M. Green, Bethel; Dr. John Melville, Bakersfield; Dr. P. P. White, Williamsville; Dr. C. M. Ferrin, Essex.

Paper, Report From the London and American Congress of Tuberculosis, by Dr. H. Edwin Lewis, Editor of Vermont Medical Monthly, Burlington.

Discussion by Dr. E. M. Brown, Sheldon; Dr. L. W. Hubbard, Lyndon Center; Dr. W. N. Bryant, Ludlow; Dr. J. H. Copeland, Lyndonville; Dr. T. R. Stiles, St. Johnsbury.

THURSDAY MORNING.

Paper, Infectious Diseases, by Prof. George H. Fox, M. D., New York City.

Discussion by Dr. J. H. Hamilton, Richford, formerly Secretary State Board of Health; Dr. W. G. Church, Burlington; Dr. S. E. Darling, Hardwick; Dr. H. D. Belden, St. Albans; Dr. A. L. Bingham, Williston; Dr. G. H. Branch, Grand Isle.

Paper, Water Supplies of our Vermont Towns, by C. P. Moat, Chemist to Laboratory of Hygiene.

Discussion by Dr. D. C. Noble, Middlebury; Dr. William Lindsley, Montpelier; Dr. F. S. Hutchinson, Enosburg Falls; Dr. W. J. Aldrich, St. Johnsbury; Dr. John Gibson, Vergennes.

Dr. H. Edwin Lewis has kindly consented to arrange a museum of pathological specimens, illustrative of different stages of tuberculosis and of the means adopted for fighting this disease. This display will be largely from specimens shown at the American Congress of Tuberculosis. There will also be a general exhibit of Sanitary Appliances, by houses dealing in these goods. Tuesday evening will be devoted to an examination of these various exhibits and to an inspection of the State Laboratory.

Wednesday evening Dr. John C. Sundberg of New York will give a lecture on Sanitation in the East, illustrated by a large number of stereopticon views.

Reduced rates will be given over the following railroads: Central Vermont, Boston & Maine, Rutland and branches, Woodstock, Montpelier & Wells River, and Canadian Pacific.

All persons attending the School are requested on their arrival to immediately register at the Laboratory of Hygiene, No. 196 Main Street. A list of boarding houses will there be furnished, where those who prefer can be entertained at very moderate expense.